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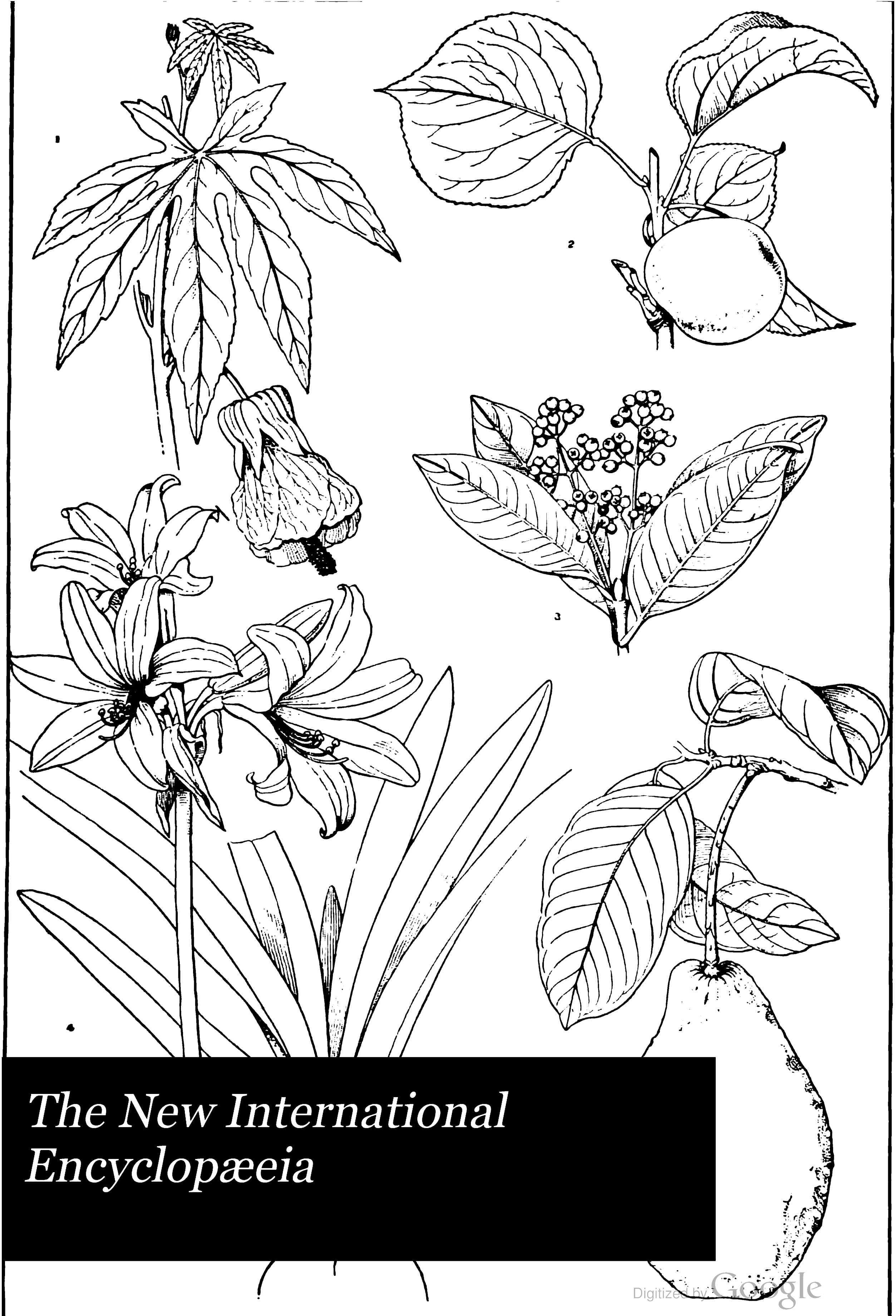

The New International Encyclopæeia

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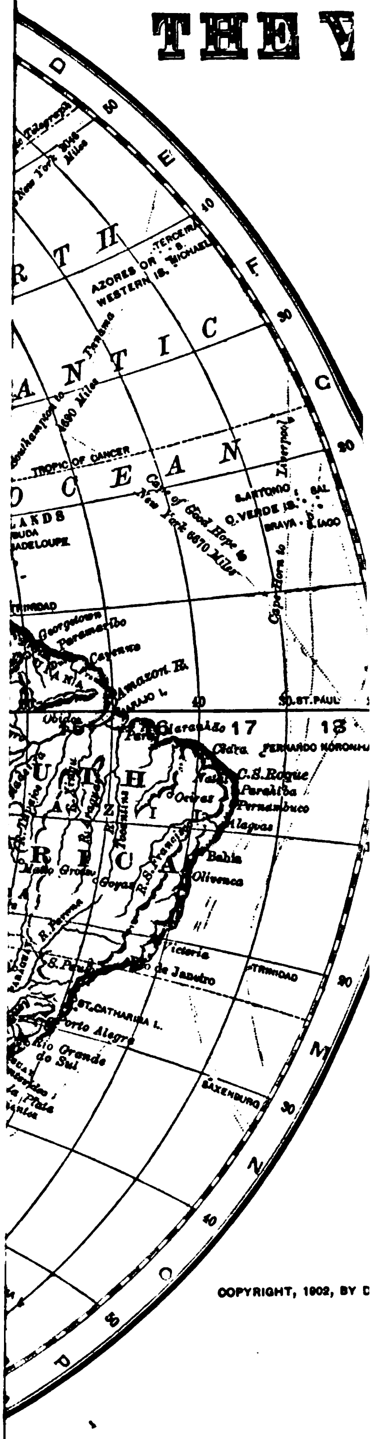

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THE NEW INTERNATIONAL ENCYCLOPÆDIA

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VOLUME I

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PREFACE.

THE work which is now given to the public after years of diligent preparation is not a new edition or revision of the *International Cyclopædia.* It is not based upon that or upon any other publication. The comparatively small portion of text which has been retained unaltered from the *International Cyclopædia* and incorporated in these volumes has been so retained because it has successfully stood the test of searching criticism, and because the Editors regard it as satisfying the most exacting requirements. This, however, is the full extent of the new Encyclopædia's obligation to the old. The present work has been planned and executed as a wholly independent and original undertaking. It represents the practical knowledge gained from an editorial experience of many years. It embodies the results derived from a critical study of all the most famous works of reference which have at any time appeared in Europe or in the United States.

Every encyclopædia which has secured a lasting hold upon the confidence of the reading public has necessarily been distinguished by some especial merit of its own; yet in the case of each existing publication, this peculiar merit has invariably been offset to a greater or less extent by some counterbalancing defect. Hence, there has always been discernible a decided difference of opinion, both among critics and among readers, as to which one of the standard encyclopædias best fulfills the proper function of such a work. The ideal encyclopædia is one that combines four attributes: first, accuracy of statement; second, comprehensiveness of scope; third, lucidity and attractiveness of presentation; and fourth, convenience of arrangement. Any compilation of this character, which conspicuously fails to embody all of these essential qualities, falls short to that extent of the ideal; and it must be said that no one of the great encyclopædias which are already in existence can fully stand this test. In the course of time there have gradually been developed three distinct and well-known types of encyclopædic publications, each one of which may be regarded as the concrete expression of a single predominating purpose. Thus the *Encyclopædia Britannica* represents, in most of its departments, accuracy combined with fullness of detail, and in its own especial sphere, which is that of science, it long remained without a rival. It is, indeed, as every one is well aware, far less a true encyclopædia than a collection of elaborate monographs, so scholarly and so diffuse that many of these so-called articles have actually been published separately as treatises on their respective subjects. Nevertheless, the *Encyclopædia Britannica,* though its authority has been very great, has never proved to be a wholly adequate and satisfactory work of reference. In the first place, through the massing of its information under a comparatively few titles, it is ill adapted for popular use, even with the aid of the ponderous index which its publishers appended to it in a final volume. In the second place, it omits so many topics of general interest as to oblige its purchasers to supplement it by some more popular if less monumental work. Finally, the treatment of its most important topics is extremely technical and therefore to the great majority of readers almost unintelligible. Hence, the *Encyclopædia Britannica,* while generally accurate and authoritative, is neither truly comprehensive in its scope nor lucid in its method of presentation, while it is decidedly inconvenient for purposes of ready reference.

The great French encyclopædia of Larousse is found in every important library throughout the world, and it is in some respects a model work. In it, the different departments are judiciously divided, and they are treated in detail under the separate titles most appropriate to these divisions. The work, moreover, is unusually complete, and the literary treatment of the different topics included in its text is clear and at times vivacious and entertaining. There exists, however, throughout its pages a lack of accuracy which frequently misleads the reader, while the number of the volumes and their excessive bulk render the encyclopædia both inconvenient in use and almost prohibitory in cost.

The famous *Conversations-Lexikon*, completed and first published by Friedrich Arnold Brockhaus in 1812, and continued by him and his successors through many subsequent editions down to the present time, is an approximation to the ideal encyclopædia. Its accuracy has become proverbial. Its selection of topics and its careful division and sub-division of them for treatment in detail have secured both comprehensiveness of scope and convenience of arrangement. Where it falls short of approaching something like perfection is in the dryness of its narration and its thoroughly German neglect of literary form. Nevertheless, on the Continent of Europe it has long been accepted as the standard encyclopædic work of reference, and it has been translated and imitated in almost every country, notably in the valuable and popular encyclopædia of Chambers, of which the edition that appeared at Edinburgh in 1860 was not only based upon the *Conversations-Lexikon*, but was confessedly in part translated from it.

These three types of encyclopædia represent, as it were, the survival of the fittest, and each of them owes something to the others. Historically, all three have been developed out of the ponderous compilations of the eighteenth century, among which Zedler's *Universal-Lexikon*, in sixty-four volumes (1750), d'Alembert and Diderot's famous *Encyclopédie* in twenty-eight (1772), and Ersch and Gruber's *Allgemeine Encyclopädie* in more than one hundred and sixty volumes remain the most remarkable examples. The gradual evolution of the modern encyclopædia forms, indeed, an interesting study. The older works originally grouped their articles under related departments rather than in alphabetical order; and it was only after many years that the alphabetical arrangement came into general use as being infinitely more convenient for the reader, even though theoretically less scientific. The elaborate system of cross-references, which is now a subject of especial study on the part of all encyclopædic editors, was first developed by Ephraim Chambers in the early part of the nineteenth century. The elucidation of the text by means of diagrams, maps, portraits, colored plates, and other illustrations, was at first quite sparingly employed; but it was an interesting feature of the *Encyclopædia Britannica*, and was finally adopted on a very lavish scale by Brockhaus and by Meyer in Germany.

All modern encyclopædias have incorporated these three features as being absolutely essential. Such fundamental differences as are perceptible between them will be found to exist partly in the scope and purpose of each separate publication, and partly in the method by which the original design has been carried out by those to whom the task has been committed. It therefore seems desirable that, in writing these words of introduction, the Editors of the NEW INTERNATIONAL ENCYCLOPÆDIA should set forth as briefly, yet as clearly as is possible, the manner in which they have endeavored to insure at least a close approximation to what, in their best judgment, an ideal encyclopædia should be.

Since accuracy is very properly regarded as the most essential of all the attributes of such a publication, the Editors have been at especial pains to make this work in its several departments fitly representative of modern scientific scholarship. There has long prevailed in certain quarters a definite yet quite untenable belief that this result can be most satisfactorily attained by assigning sets of articles to separate contributors of eminence, for them to write what pleases them and then to sign what they have written. The signed article, it has been claimed, is the best possible guarantee of accuracy, since it carries with it the weight and the authority of its author's name. This theory, however, will not bear a close examination. For it is evident that no single specialist, however eminent, can be so thoroughly equipped at every point as to leave in what he writes no room for criticism. He has his individual preferences strongly marked, and necessarily also his individual bias. In treating matters of scientific doctrine, therefore, he will quite unconsciously give to his statements the coloring of his own personal beliefs. In discussing controversial topics, he will with the same unconsciousness lay more stress upon the theories which he holds himself than upon those which are accepted and maintained by other men of equal eminence. Moreover, he is apt to assume upon the reader's part too great a familiarity with the subject, and hence to employ language which is excessively technical and difficult to understand. Finally, when the individual contributor is permitted to treat his chosen topics in his own way and without reference to what other contributors have done, there will necessarily result a lack of symmetry and proportion which will be perceptible to the most casual reader of the completed work. These facts have been so often demonstrated in the past as to have led the editors of the Brockhaus *Conversations-Lexikon* to reject the signed article altogether, and to substitute for the individualistic system another system under which each article, though originally written by a single specialist, is subsequently criticised by other specialists through whose hands it passes and by whom it is so modified as, in its final form, to be no longer the work of one particular individual. It represents instead the collective knowledge and the different view-points of a number of highly trained and able men, while it usually receives, as well, a finishing touch from the general editor, who bears constantly in mind the inestimable value of simplicity, proportion, and clearness. No signed article can ever have the completeness, the authority, and the practical value of an article prepared in such a way as this; and the proof of the assertion is found in the undisputed fact that the encyclopædia of Brockhaus has been universally recognized as the most minutely accurate work of reference that exists to-day. Moreover, as a practical matter, the signed article frequently involves a certain inevitable deception. As new editions of an encyclopædia appear, a multitude of changes in the text are necessarily demanded in order to add new facts and modify old theories; and these changes are often made by other hands than those of the original contributors, so that many articles to which a writer's name is signed are no longer in reality his own. Hence the Editors of the present work have, after much deliberation, dispensed entirely with the signed article. In its stead, they have arranged that every important contribution to the work, while written by a specialist of acknowledged competence, shall nevertheless pass through other hands and receive its final form upon the basis of mutual discussion, criticism, emendation, and suggestion. It is proper here to acknowledge the great value of the assistance rendered by Mr. Louis Heilprin, who has read all the proofs, and whose minute and varied knowledge and wide experience have assured a very high degree of accuracy.

In the second place, the endeavor has been made to render this Encyclopædia more comprehensive in its scope than any other. The rapid march of science during the past few years, the new inventions and discoveries that have been made, the political and social changes that have been effected, and the multitude of absolutely new interests that have arisen in almost every department of human activity, have added an immense mass of topics to the list with which former encyclopædias have had to deal. It is believed that all these topics have here received adequate and accurate attention; while a much greater completeness than is usual will be found in the treatment of nearly every department. It is desirable to call especial attention to the amount of space that has been given to the subject of Geography, both physical and political, and to the carefully selected information relating to municipal organization and the management of public utilities — information such as has never before been systematically given in any encyclopædia published in the English language. Something also should be said of the fullness and the modern character of the articles bearing upon the several departments of Biology, Botany, Education, and Psychology, the Mechanical Arts, Physics, Military and Naval Science, Sociology, and Biography. As to the last-named subject, it may be said, without fear of contradiction, that no encyclopædic reference-book in England or America contains as titles so many names of men and women; while the information given under these titles is brought down to the very eve of the publication of this work. Another department of great interest and value is that which has to do with what may be called miscellaneous information and which covers a range of topics not heretofore included in a general encyclopædia. Under this head will be found, for instance, the titles of famous books, comprising works of fiction, the names of the important characters in imaginative literature, the explanation of political nicknames and popular allusions, and in fact all that class of subjects which has ordinarily been found only in Readers' Handbooks, and similar special compilations. It should be noted, too, that the pronunciation of all unusual, technical, or foreign words has been carefully figured in accordance with a simple phonetic system, and that their etymology has been systematically traced. This etymological work has been done with careful regard to the conclusions of the newest school of philological research, and the facts are set forth as simply and as clearly as is possible. For the convenience of the general reader, all the words and stem-forms belonging to the Greek or to the Oriental languages have been transliterated. Care has been taken to supply every important article with a well-selected bibliography for the guidance of those who may wish to pursue the subject in all its ramifications; and the bibliographical material will be found to comprise not only the standard works, but also special monographs, pamphlets, and papers published by the various learned societies. The Encyclopædia as a whole, then, is in reality a library whose books are so divided and arranged as to make the information which they afford immediately and conveniently accessible to the reader. It is this completeness which justifies the title "International" in its application to this work. The word is one which possesses a new significance to Americans at the present time, when our country has shaken off its former isolation, and has developed so many points of contact, political and commercial, with the other nations of the earth. Yet while the work is international, it is international from an American point of view, and it very naturally gives the fullest treatment to those topics which are of immediate and vital interest to Americans.

With regard to the third essential — lucidity and attractiveness of presentation — the recognition of its value which has been expressed above, will afford, perhaps, a clue to what the Editors have endeavored to accomplish. There exists a kind of writing which has become so stereotyped as to be well known to every one, and which might be fittingly described as the encyclopædic style. It is in literature what a monotone is in music — utterly devoid of individuality, of variety, and of interest. It sets forth every possible subject in the same dull way and robs the most living themes of their vitality. This style has even acquired, by the influence of tradition, a pseudo-sanctity, until many persons have become convinced that an encyclopædic article must inherently and inevitably be a synonym for dullness. This view the editors are very far from entertaining, or from desiring to perpetuate; and so the principal contributors have been selected not only for their special knowledge, but also for their possession of a clear, attractive style; and in those articles of which the subjects lend themselves to a distinctly literary treatment, the authors have been expected to write with the same freedom and with the same personal touch as would characterize their contributions to any literary publication of a high class. As the Encyclopædia is intended first of all for the general reader, it has been written from the general reader's point of view, and in such a way as to be free from all vexatious technicalities. Regard, moreover, has been had to form, and to a logical order of presentation. In every detail, the endeavor has been made to compact really valuable information instead of loosely assorted and often unrelated facts. Even the statistics, which in many works of this character are thrown together in a mass, have been used in such a way as to exhibit comparisons which are significant and which possess an interest of their own for every person of intelligence. In short, the aim has been consistently to present each subject not only so as to inform, but likewise so as to attract and entertain.

The fourth essential of a useful encyclopædia is found in the practical convenience with which it may be consulted. This practical convenience has been studied very carefully both by the Editors and by the contributors with the object of enabling a reader to find, with the least possible expenditure of time and patience, the information of which he is in need. This end has been attained, first, by giving a conspectus of each topic as a whole; second, by treating the same topic more in detail under all the natural divisions into which it falls; and finally, by working out a system of cross-references which may serve as guides from each topic to the others which supplement it and provide the collateral information necessary to its fullest understanding.

It is thought that the illustrations of every kind will be found superior to anything hitherto attempted in any encyclopædia. These illustrations have not been gathered together in a haphazard fashion and merely for the purpose of providing the volumes with a certain number of attractive pictures; but they were suggested and selected by the various contributors, or prepared with their coöperation. In many cases much assistance was derived from the Governmental Departments in Washington, where all the plates relating to Natural History were examined and verified by experts in the Government's employ.

The Editors are thoroughly aware of the formidable character of their undertaking. No one, in fact, who has not been intimately associated with the making of a great encyclopædia can fully understand the difficulties which are inherent in such a task, involving as it does the coöperation of a large body of highly trained and scientifically qualified experts, and demanding so many and such varied forms of effort—organization, selection, knowledge, literary skill, critical judgment, and a true sense of proportion. Nor has it been forgotten that such a work as this should be something more than a convenient book of reference. Encyclopædias have in the past performed, and they are still performing, a remarkable educational function in disseminating exact knowledge upon an immense variety of subjects. It would be difficult to overestimate the influence which has been exercised by such famous works as those which have been mentioned in the preceding pages; for they have been really libraries, and to thousands upon thousands of families they have been the only libraries available. To prepare a book which shall professedly discharge a function so important is no light undertaking; to obtain even a fair measure of success is a memorable achievement. It is the hope of the Editors of this Encyclopædia that the test of time will show them to have profited alike by the merits and by the defects of the works which have preceded it; and that the result may be approved as embodying the experience of the past with an intelligent conception of the requirements of the present.

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NEW YORK, June 5, 1902.

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KEY TO PRONUNCIATION.

ā	as in	ale, fate. Also see ĕ, below.
ā̇	" "	senate, chaotic. Also see ĕ, below.
â	" "	glare, care.
ă	" "	am, at.
ä	" "	arm, father.
ȧ	" "	ant, and final *a* in America, armada, etc. In rapid speech this vowel readily becomes more or less obscured and like the neutral vowel or a short u (ŭ).
a	" "	final, regal, where it is of a neutral or obscure quality.
a̤	" "	all, fall.
ē	" "	eve.
ē̇	" "	elate, evade.
ĕ	" "	end, pet. The characters ĕ, ē, and ȧ are used for ä in German, as in Gärtner, Gräfe, Hähnel, to the values of which they are the nearest English vowel sounds. The sound of Swedish ä is also indicated by ĕ.
ẽ	" "	fern, her, and as *i* in sir. Also for ö, *oe*, in German, as in Göthe, Goethe, Ortel, Oertel, and for *eu* and *oeu* in French, as in Neufchâtel, Crèvecœur; to which it is the nearest English vowel sound.
e	" "	agency, judgment, where it is of a neutral or obscure quality.
ī	" "	ice, quiet.
ī̇	" "	quiescent.
ĭ	" "	ill, fit.
ō	" "	old, sober.
ō̇	" "	obey, sobriety.
ô	" "	orb, nor.
ŏ	" "	odd, forest, not.
o	" "	atom, carol, where it has a neutral or obscure quality.
oi	" "	oil, boil, and for *eu* in German, as in Feuerbach.
o͞o	" "	food, fool, and as *u* in rude, rule.
ou	" "	house, mouse.
ū	" "	use, mule.
ū̇	" "	unite.
ŭ	" "	cut, but.
ụ	" "	full, put, or as *oo* in foot, book. Also for *ü* in German, as in München, Müller, and *u* in French, as in Buchez, Budé; to which it is the nearest English vowel sound.
û	" "	urn, burn.
y	" "	yet, yield.
B	" "	the Spanish Habana, Córdoba, where it is like a *v* made with the lips alone, instead of with the teeth and lips.
ch	" "	chair, cheese.

D	as in	the Spanish Almodovar, pulgada, where it is nearly like *th* in English then, this.
g	" "	go, get.
G	" "	the German Landtag, and *ch* in Feuerbach, buch; where it is a guttural sound made with the back part of the tongue raised toward the soft palate, as in the sound made in clearing the throat.
H	as *j* in	the Spanish Jijona, *g* in the Spanish gila; where it is a fricative somewhat resembling the sound of *h* in English hue or *y* in yet, but stronger.
hw	" *wh* in	which.
K	" *ch* in	the German ich, Albrecht, and *g* in the German Arensberg, Mecklenburg; where it is a fricative sound made between the tongue and the hard palate toward which the tongue is raised. It resembles the sound of *h* in hue, or *y* in yet; or the sound made by beginning to pronounce a *k*, but not completing the stoppage of the breath. The character K is also used to indicate the rough aspirates or fricatives of some of the Oriental languages, as of kh in the word Khan.
n̲	as in	sinker, longer.
ng	" "	sing, long.
N	" "	the French bon, Bourbon, and *m* in the French Etampes; where it is equivalent to a nasalizing of the preceding vowel. This effect is approximately produced by attempting to pronounce 'onion' without touching the tip of the tongue to the roof of the mouth. The corresponding nasal of Portuguese is also indicated by N, as in the case of São Antão.
sh	" "	shine, shut.
th	" "	thrust, thin.
TH	" "	then, this.
zh	as *z* in	azure, and *s* in pleasure.

An apostrophe ['] is sometimes used to denote a glide or neutral connecting vowel, as in tā'b'l (table), kăz''m (chasm).

Otherwise than as noted above, the letters used in the respellings for pronunciation are to receive their ordinary English sounds.

When the pronunciation is sufficiently shown by indicating the accented syllables, this is done without respelling; as in the case of very common English words, and words which are so spelled as to insure their correct pronunciation if they are correctly accented. See the article on PRONUNCIATION.

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THE NEW INTERNATIONAL ENCYCLOPÆDIA

A a. The initial letter of almost every alphabet. The Runic "futhark," or old Germanic alphabet, forms an exception to this rule. The *a* stands in the fourth place in the "futhark." (See Runes). A suggestion has been made, but apparently without much acceptance, that the position of *a* in the "futhark" may possibly be due to an artificial arrangement of the letters modeled perhaps upon the order of the words in the old Teutonic form of the Paternoster. The Ethiopic alphabet likewise departs from the common scheme, for it places *aleph* in the thirteenth place instead of the first. As our alphabet, moreover, directly follows the Latin, which itself is based on the Greek, the form of our letter *A*, *a* agrees with the same character in those languages. The letter was called *alpha* in Greek, whence "alphabet," like our own "A, B, C," or "Absey Book." The Greek name and form of the letter agree with the West Semitic alphabet, as shown by the Hebrew and the Aramaic. In these two languages it is designated as *aleph*, *alph*, but the real meaning of the name and the origin of the symbol have not yet been satisfactorily determined, and the subject is still under discussion.

Phonetic Character. In regard to its phonetic character, original *a* may be described as a "mid-back-wide" vowel. It had what we may term the *ah*-sound, familiarly known as the "Italian" or "Continental" *a*, heard in *far*, *father*. By nature *a* is a simple and easy vowel, made by opening the throat naturally and expelling the breath with the least modification by the parts of the mouth. Such is the sound that this letter has in most languages; in English, however, it has undergone so many modifications that to-day the pure *ah*-sound is comparatively scarce in our speech, and instead of calling the letter itself by the name *ah*, as in most Indo-Germanic tongues, we now term it "*ay*" (*ae*), as in Tennyson (*The Epic*, ad fin.) "Mouthing out his hollow *oes* and *aes*." The Anglo-Saxon or earliest English preserved the genuine old *ah*-sound, though shorter perhaps in quantity than the *a* of *father*. It was of quite frequent occurrence, and by its side existed the corresponding long *a*, often marked with the quantity sign. In Anglo-Saxon, short *a* was subject, however, to certain modifications and shiftings. (See Phonetic Laws.) These modifications account only in part for the variety of sounds which the Modern English *a* represents, as other external influences have come in to alter the sound still more. The orthography has not kept pace with the change in pronunciation; hence the anomalous character of *a* as a sound-symbol. There are some half-dozen different sounds, shorter and longer, which *a* may represent in English; some of these sounds are, of course, extremely common; others are comparatively rare. The principal are:

(1) *fat*,
(2) *fate*,
(3) *fare*,
(4) *father*,
(5) *false*,
(6) *what*, *was*.

To these is to be added the vowel sound in *ask*, *chance*, *can't*, *past*, which varies with different speakers, and is apparently to be placed somewhere intermediate between *fat* and *father*. Likewise is to be noted the indifferent sound of *a*, approaching the *u* in *but*, that so frequently occurs in unstressed syllables, like *a*gainst, abund*a*nt, and also the sporadic *a* in *any*, *many*, where it approaches a short *e*. The rounded vowel above noted in *was*, *false*, and the like, is due to the influence of the adjacent consonant, *w*, *l*. The former sound, the *a* in *was*, is longer than the *a* in *all*. In the latter case with *l*, we find also *au* beside *a* to express the sound, as *fault* beside *false*. The commonest short sound of *a* in English, however, is the flat vowel in *hat*. Its frequency leads to our calling this the "short *a*;" as the corresponding "long" we generally assign the vowel in *hate*, although the latter is really the long *e*-sound of *they*. The vowel of *fare*, *bare*, is a still further modification.

Indo-Germanic *a*. In the Indo-Germanic languages the vowel series *a*, *i*, *u* is especially prominent; in Sanskrit, and also in Gothic, these are the only short vowels. The short *a* is never written in Sanskrit after consonants, but is regarded as inherent in the sign. Owing to these circumstances it was believed, until within recent years, that the primitive Indo-Germanic speech possessed only *a*, *i*, *u*, and that *a* was the oldest and purest of the vowels. This view has since been much modified; it has been shown that *e* and *o* must have existed beside *a*, *i*, *u* in the primitive speech, and that they are of equal age with the others. As an instance of a genuine Indo-Germanic short *a*, we may take Indo-Ger. **agro-s*, "field, acre;" Skr., *ájra-s*; Gk. *ἀγρός*;

Lat., *ager;* Goth., *akr-s*. The corresponding long *ā* occurs commonly in the oldest English, as in the other Indo-Germanic tongues; the history of its development into the modern speech, however, has been somewhat different, as it has passed over chiefly into an *ō*-sound. (See PHONETIC LAWS.)

AS A SYMBOL. Standing at the head of the alphabet as *a* does, it is commonly used as a symbol to denote the first in order in a row or series. It is therefore so employed to denote one of the notes (*la*) in musical notation (q.v.); similarly in logic (q.v.) to denote the universal affirmative. In algebra (q.v.) the letters *a*, *b*, *c* are used to denote known quantities as opposed to *x*, *y*, *z*, the unknown quantities. In abstract reasonings and hypotheses, A, B, C are likewise employed as convenient designations for particular persons and things. In writing and printing, the series a, b, c is commonly used for reference. In nautical matters, A1, A2, A3 are in common use to denote the class and quality of ships and similarly in business matters to indicate the commercial standing of a house. This usage has passed over into popular parlance, so that a person is sometimes spoken of as "A1" to indicate that he is a thoroughly reliable, "first-class" man. A stands also as the first of the Dominical Letters (q.v.).

IN GRAMMATICAL FORMS. This same letter is used in a number of phrases and grammatical forms in English. In some of these it is the mutilated form of a fuller word. The first use to be noted is its employment beside *an* as an indefinite article; both forms, *a*, *an*, are weakened from the A. S., *ān*, "one." In provincial dialects *a* ('a) appears as a pronominal form for *he*, etc., as in *quotha*, "quoth he." Sometimes it thus stands for *have*. It appears as a preposition for A. S., *on*, with a verbal noun in certain old phrases, as *a-hunting, a-building;* also for A.S., *of* in *Jack-a-lantern, John a Gaunt;* and similarly as a prefix for A. S., *on* in *asleep* (A. S. *on slæpe*), *away* (A. S. *on weg*), for *off* in *adown* (A. S. *of dūne*); again intensive in *a-thirst* (A. S. *of-thirst*). It likewise stands for long *ā* as a verbal prefix, *arise* (A. S. *ārīsan*), *awake*, and in many other phrases. The character *å* is used in Swedish as a labialized guttural, like English *ō*. See ALPHABET and ABBREVIATIONS.

A. As a note in music, the major sixth of the scale C major. See KEY for A major and A minor.

A1. A symbol used in the classification of wooden ships by Lloyds Maritime Insurance Association. The designation follows as a result of examination of a ship by one of the Lloyds surveyors. The symbol A1 denotes that hull and equipment of the ship in question are in good condition; the letter A standing for construction and the numeral 1 for equipment; when the latter is inadequate the figure 2 is used. Should the symbol be preceded by figures, thus, 12A1, it means that the classification is good for 12 years. A1 vessels may receive further extension of classification (1 to 8 years), and the symbol becomes 12-A1 Cont. 6A1, which means original 12 year class continued 6 years. If later restored it would still be possible to remain in A1 class with the following symbol: 12A1-Cont. 6A1- Rest. 6A1. When a vessel has passed the age for the character A, but is still found fit for conveying perishable goods to all parts of the world, it is registered A in red. Ships designated A in black form the third class, and are allowed to carry perishable goods on *shorter voyages*.

In classifying iron ships a broad A is used with numbers prefixed, those ships classed 100**A** to 90**A** inclusive requiring to be surveyed every four years, and those classed 85**A** and under requiring a special survey every three years. The numerals referring to equipment are the same as for wooden ships. In the classification of the German Lloyds, A1 refers to new wooden ships and repaired ships of equal quality; A denotes ships not equal to the former class, but yet of superior construction; the terms BI, B, CL and CK denote those of inferior construction. Iron and steel ships are designated by the characters **A**, **A**, **A**, with the numerals 100, 95, 90, etc., prefixed (100 **A** for example), and referring to the structural strength. The number under the cross-arm of the **A** denotes the number of years that may elapse before the vessel must be resurveyed. An interesting account of the development of the methods of classification and surveying of the British Lloyds, as well as the history of the society itself, will be found in *Annals of Lloyd's Register of British and Foreign Shipping* (London, 1884). The rules for the building, equipment and classification of ships are not given in the annual *Register of Shipping*, but are published separately in four volumes, one for steel vessels, one for iron, one for wooden and composite, and one for yachts.

AA, ä. The name of a number of rivers and streams in Holland, Germany, Switzerland, Russia, and the north of France. As many as forty have been enumerated. The word is said to be of Celtic origin, but it is allied to the O. N. *á*, O. Ger. *aha*, Goth. *ahva*, identical with the Lat. *aqua*, "water." Ach or Aach is another form of the same word. Four streams of the name of Ach fall into the Lake of Constance. The word, in both forms, occurs as final syllable in many names of places, as Fulda (formerly Fuldaha), Biberach, Bieberich, etc. In the plural it is Aachen (waters, springs), which is the German name of Aix-la-Chapelle (q.v.). Aix, the French name of so many places connected with springs, is derived from Lat. *Aquæ*, which became in O. F. *Aigues* and then *Aix*. Compare the Celtic *Esk, Ex, Axe, Ouse*.

AACHEN, äG'en. See AIX-LA-CHAPELLE.

AAHMES. See AMASIS.

AALBORG, ạl'bôrk (Eel-town). A city of Denmark, capital of the Amt of Aalborg, in Jutland, on the south shore of the Limfjord (Map: Denmark, C 1). The town has a cathedral, a museum, and a library of 30,000 volumes. It is situated on one of the branches of the Danish State Railway, which here crosses the Limfjord on an iron bridge 990 feet long and 16 feet wide. The manufactures of the town are considerable, consisting chiefly of brandy and spirits, cotton goods, dyed articles, cement, and lumber. There is an electric lighting plant. There are some shipbuilding and sea trade, the latter with England, Norway, and Sweden, for the most part in vessels owned by citizens of the town. The harbor is too shallow for large vessels. Aalborg has long been an important commercial centre. It was plundered by Wallenstein in 1627, and by the Swedes in 1644 and 1657. Pop., 1890, 19,503; 1906, 31,509.

AALESUND. See ÅLESUND.

AALI PASHA, ä′lē pȧ-shä′ (1815-71). A Turkish statesman and diplomat. He entered the public service at fifteen years of age; was *chargé d'affaires* in London in 1838, and from 1841 to 1844 Ambassador to Great Britain. He then became Minister of Foreign Affairs, and several times after 1852 was Grand Vizier. He was also promoted to the rank of Field-Marshal and Pasha. In 1856 he represented the Porte at the Congress of Paris, and in 1871 took a prominent part in the London conference for the settlement of the Black Sea question. He was favorable to progress, and strove earnestly, though ineffectually, to introduce reforms in the Turkish Government.

AALST, älst. See ALOST.

AAR, or **AARE,** är (perhaps connected with Skt. *ara*, swift). The largest tributary of the Rhine in Switzerland. It rises in the glaciers near the Grimsel in Bern, at an altitude of 7345 feet (Map: Switzerland, C 1), flows northwest and enters Lake Brienz after forming the famous falls of Handeck, 200 feet high. Issuing from Lake Brienz it enters Lake Thun, passing the town of Interlaken. On emerging from the latter lake, the Aar becomes navigable, and after a winding course westward reaches the Jura Mountains, and flows along their southern slope down to its confluence with the Limmat, where it breaks through the ridge and enters the Rhine near Waldshut. Its entire length is about 175 miles, and among its numerous tributaries the most important are the Saane, Zihl, and Emme. Through its tributaries the Aar is connected with some of the principal lakes in Switzerland. The most important cities on its banks are Bern, Interlaken, Solothurn, and Aarau. There are several small rivers of the same name in Germany.

AARAU, ä′rou (*aar* + Ger. *Aue*, meadow, from *aha*, water). Capital of the canton of Aargau, Switzerland, near the Jura Mountains, on the right bank of the Aar, 41 miles northeast of Bern (Map: Switzerland, C 1). It is 1100 feet above sea level, and lies in a fertile plain between the Jura and the Swiss plateau. It is well built: has a town hall, barracks, several small museums, and a library for the canton of 89,000 volumes, rich in Swiss historical works. There are silk, cotton, leather, and cutlery factories, an iron foundry famed for its cannon and bells, and other workshops. The town is famous for producing excellent mathematical instruments. North and northeast of the town are the Wasserfluh, 2850 feet high, and the Giselafluh, 2540 feet high. The River Aar is here crossed by a suspension bridge. Eight fairs are held at Aarau yearly. Pop., 1900, 7995.

AARD-VARK, ärd′värk′ (Dutch, "earth-pig"). A burrowing, nocturnal, insect-eating mammal (*Orycteropus Capensis*), native and common in South Africa. It is about 5 feet long, including a long, tapering, naked tail. The head is long, thin, and somewhat pig-like, with a tubular snout and high, pointed ears. The body is stout, fat, and thinly covered with bristly, reddish hairs. The limbs are short, strong, and equipped with claws adapted to digging in hard ground. It inhabits open regions, is timid and mainly nocturnal, lives in burrows, and feeds upon insects, mainly ants and termites, breaking into their "hills" and gathering them into its small mouth by means of its long, protrusile tongue, which is coated with glutinous saliva. The flesh is edible, but likely to taste of the formic acid in its food. A closely allied species (*O. Æthiopicus*) inhabits northeastern Central Africa. These two animals (with several fossil species) represent the Orycteropodidæ, a family of Edentata differing from the remainder of that order in so many respects (including, for instance, a milk dentition) that some naturalists have proposed to establish a separate order for it. See Plate of ANT-EATERS.

AARD-WOLF (Dutch, "earth-wolf"). A nocturnal, carnivorous mammal (*Proteles lalandii*) of South Africa, resembling a small striped hyena with a dog-like head. It is closely allied to the hyena, from which it differs mainly in its weak jaws and peculiar dentition, which prevent its overcoming and eating vertebrate prey or large carrion. Hence its food consists of small carrion, of grubs, and largely of termites. Its fur is coarse, and capable of erection along the back; in color it is ashy-gray, irregularly striped up and down and around the legs with black; its muzzle is black and nearly naked; legs and feet dark brown in front and gray behind; ears dark brown outside and gray inside. It goes abroad only in the night, and several are said to live in the same burrow. It is the sole representative of the family Protelidæ. See Plate of HYENAS.

AARESTRUP, a̤′re-strụp, EMIL (1800-1856). A Danish poet, born at Copenhagen. He was little regarded during his lifetime, but since the publication of his collected poems, with a critical essay by Georg Brandes, he has been deemed one of the first lyrists of Denmark.

AARGAU, är′gou, or **ARGOVIE,** är′gō′vē′. A canton of northern Switzerland, with an area of 540 square miles (Map: Switzerland, C 1). Its surface is mostly mountainous, but there are a number of fine valleys. The chief rivers are the Aar, a tributary of the Rhine, and its tributaries, the Reuss and the Turgi. There are a number of mineral springs. The soil is very fertile. The vine is cultivated extensively in the river-valleys and the output of dairy products is considerable. The manufacturing industries are well developed and give occupation to about 18,000 people. The production of textiles is the chief industry. For purposes of administration the canton is divided into eleven districts. The legislative power is vested in the assembly (*Grosse Rat*), elected at the rate of one member for every 1100 inhabitants. The executive power is in the hands of a council (*Regierungsrat*) of five members, chosen by the assembly for a period of four years. The referendum is frequently resorted to, and for private initiative in legislation 5000 votes are required. In the National Council Aargau is represented by ten members. The population was 193,580 in 1890 and 206,460 in 1900. The inhabitants are mostly of German origin, and the German language is spoken by almost the entire population. Capital, Aarau. Aargau, in its original extent much larger than the present canton, was a part of ancient Helvetia, and was subdued by the Franks in the fifth century. It was held by the Hapsburgs from

1173 till 1415, when it was taken from them by the Swiss Confederates, who gave parts of it to Bern and Lucerne. In 1798 the district was divided into the cantons of Aargau and Baden, which became members of the Helvetic Confederation. Ruled mainly by the aristocratic party, Aargau gained a liberal constitution in 1831, and since then has been the champion of democracy against the reactionists and the clericals. Consult: *Historische Gesellschaft des Kantons Aargau* (Aarau, 1898), and J. Heierli, *Die Archäologische Karte des Kantons Aargau* (Aarau, 1899).

AARHUS, ạr'hōōs. A seaport and episcopal city of Denmark, capital of the Amt of Aarhus, Jutland, situated on a bay of the Kattegat, in a fertile plain, 68 miles northeast of Fredericia (Map: Denmark, D 2). It has a Gothic cathedral, whose erection was commenced in 1201, a museum, an exchange, and several banks. The inhabitants are engaged in shipbuilding and manufacturing. The town is connected with the rest of Jutland by the State Railroad, and there are regular lines of steamers to Copenhagen and England. The harbor is well protected by a breakwater, and admits vessels of six feet draught. The town ranks among the oldest in Denmark, for it had the first Christian church and was the residence of a bishop in 948. Aarhus was the scene of a Danish defeat by the Prussians in 1849. Pop., 1890, 33,306; 1906, 55,193.

AARON, âr'ŭn. A Jewish High Priest and elder brother of Moses. When Moses was sent on his mission of deliverance to Pharaoh, Aaron was appointed his spokesman and performed some miracles, even bringing on some of the plagues. He is always, however, the subordinate of Moses, from whom he receives his ordination as High Priest. (Ex. xxix; Lev. viii : 9.) Aaron was not so strong-minded as his brother. While Moses was absent receiving the Ten Commandments, Aaron acceded to the importunities of the people and fashioned for them the golden calf. Aaron was concerned in two rebellions. In the first, his authority, as well as the authority of Moses, was called into question by the Korahites (Num. xvi). The miraculous budding of the rod of Aaron settled that dispute. In the other, Aaron, perhaps inspired by Miriam, rebelled against the authority of Moses, but here Miriam was punished. Because of the incident at Meribah (Num. xx : 8-13) Aaron was not allowed to enter Canaan, but died and was buried on Mount Hor, on the confines of Idumæa. Eleazar, his son, succeeded to the high priesthood. In later Hebrew literature Aaron appears as the ideal priest, "loving peace, pursuing peace" (*Ethics of the Fathers*, I : 12), and as the great conciliator. Those who accept the modern Biblical criticism call attention to the fact that it is only in the Pentateuch, which, they assert, is post-exilic, that Aaron is regarded as the ancestor of all lawful priests, whereas in the earlier literature he is merely a prominent figure by the side of Moses and Miriam. The prophet Ezekiel does not trace the origin of the Jerusalem priesthood farther back than to Zadok, who lived in the days of Solomon, and when we come to the Elohistic history (see Elohist and Yahwist) we find Joshua, and not Aaron, assisting Moses in the exercise of religious rites. In the Yahwistic document Aaron is practically ignored, so that we conclude that the picture drawn of him in the Priestly Code and later portions of the Old Testament is part and parcel of the "theocratic" theory which led Hebrew writers to reconstruct Hebrew history to so large an extent. See Moses.

AARON. A character in the Shakespearean play of *Titus Andronicus*, a villainous Moor. The resemblance of Aaron's brazen avowal of his wickedness in the last act of this play to a similar passage in Marlowe's *Jew of Malta* has been cited as an indication that the *Titus Andronicus* may possibly owe its origin to the same author.

AARSENS, är'sens, Frans van (1572-1641). A Dutch diplomat. At twenty-six years of age he was sent to Paris as the agent of the States-General; later he became ambassador for the United Provinces, and long represented his country at the French Court, where he was highly regarded by Richelieu. He was also at different periods Ambassador to Venice, Germany, and England. Motley, who considered Aarsens one of the ablest diplomats of Europe, shows that he contributed largely to the unrighteous death of Barneveldt, 1619.

AASEN, ạ'sen, Ivar Andreas (1813-96). A Norwegian philologist. He was born at Söndmöre. He at first studied botany, but subsequently turned his attention to researches respecting the native dialects. Assisted by the Government, he traversed nearly the whole of Norway, investigating popular speech, upon which he sought to base a national language that should be free from Danish influence. In 1848 he published *Det Norske Folkesprogs Grammatik*, and in 1850 added *Ordbog over det Norske Folkesprog*, enlarged under the title of *Norsk Ordbog* in 1873, and in 1856 *Norske Ordsprog*, a treatise on Norwegian proverbs. Through his linguistic work he was the originator of the patriotic movement generally known as the "Maalstrœv."

AASVÄR, ạs'vâr. Islands off Norway, about latitude 66° (Map: Norway, D 3). They have herring fisheries in which more than 10,000 men are employed in December and January, but for the rest of the year they are almost deserted. The fish is the great Nordland herring, and the catch often reaches 200,000 tons in a season.

AASVOGEL, äs'fō-gel (South African Dutch for carrion-bird). Any of several South African vultures.

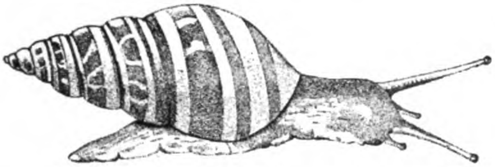
AB, äb. The fifth month of the Jewish religious year, and the eleventh (in intercalary years the twelfth) of the Jewish civil year. The first day of Ab became a fast to commemorate the death of Aaron; but of far greater significance is the ninth, commemorated as a fast to mark the destruction of the first temple by Nebuchadnezzar, 586 B.C., and of the second temple by Titus, 70 A.D., though there is no evidence to show that the latter ever took place on that day of the month. Ab corresponds roughly to July-August of the common year.

ABAB'DE. A Hamitic people west of the Red Sea, below Kosseir. Their habits are those of the desert, the camel being their chief domestic animal.

AB'ACA. A term used in the Philippine Islands to designate the plant which produces manila hemp. See Hemp, Manila.

ABACO, ä'bȧ-kō, or Lucaya, Great and Little. Two of the Bahama Islands, 150 miles east of Florida, lat. 25° 51′ N., long. 77° 5′ W. (Map: West Indies, J 1). Together they cover

ABALONE, ETC.



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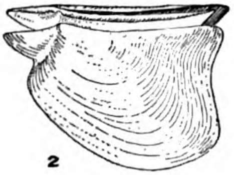

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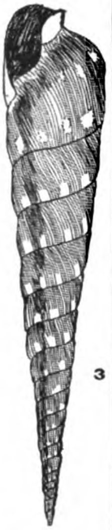

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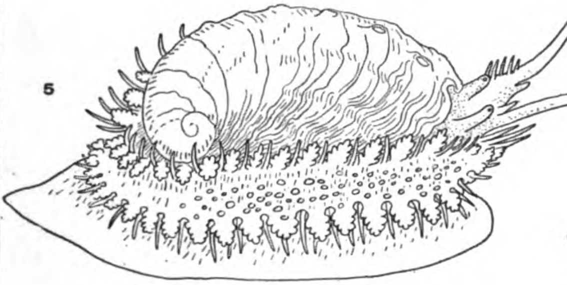

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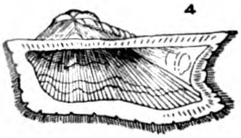

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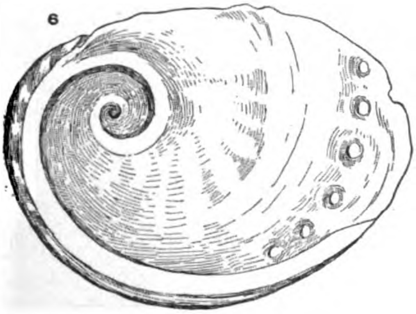

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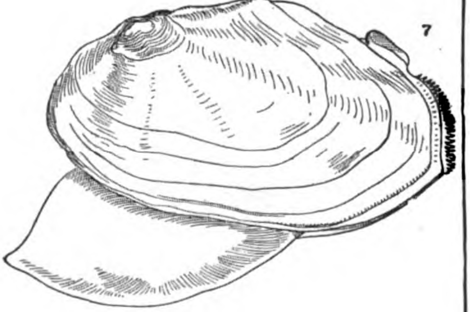

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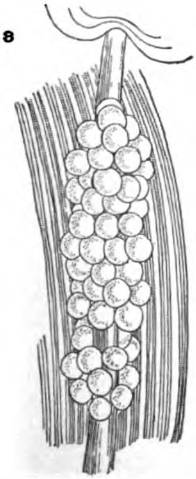

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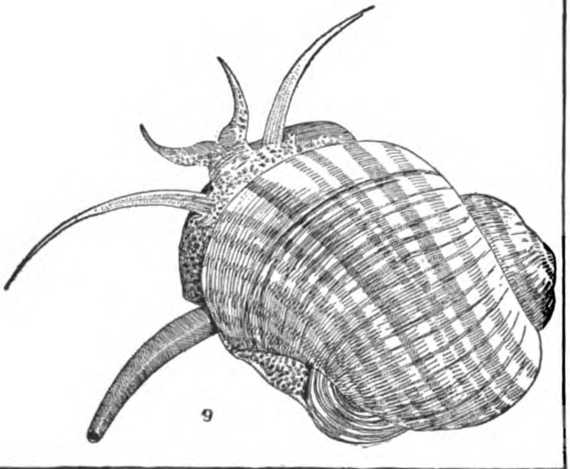

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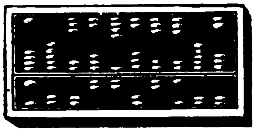
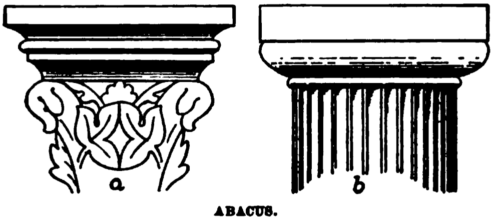
1. AGATE SHELL (Achatina), with animal extended.
2. WING SHELL (Avicula).
3. AUGER SHELL (Terebra).
4. ARK SHELL (Arca).
5. ABALONE (Haliotis), with animal extended.
6. ABALONE (interior), showing flattened spine.
7. ANODON, a River Mussel, with foot extended.
8. EGGS OF APPLESNAIL.
9. APPLESNAIL (Ampullaria), with animal extended.

an area of about 879 square miles. Shipbuilding, wrecking, and turtle-fishing are the chief employments.

AB′ACUS (Lat., from Gk. ἄβαξ, *abax*). A calculating machine or table occasionally employed in modern primary schools to make the elementary operations of arithmetic palpable. It consists of a frame with a number of parallel wires, on which beads or counters are strung. In ancient times it was used in practical reckoning, and is thus used still in China, Persia, and elsewhere. The ancient abacus consisted of a frame separated by vertical lines into columns denoting the several orders, units, tens, etc. In these columns counters were set to denote the units of each order. Counters above a horizontal line denoted five units. In the *Abacus Pythagoricus* each counter bore a number, so that only one was needed in each column, and more complicated operations could be performed. See CALCULATING MACHINES.


CHINESE ABACUS.

ABACUS. In architecture, a square or oblong level tablet on the capital of a column. It supports the entablature. In the Doric, Old Ionic, and Tuscan orders, the abacus is a regular oblong; but in the New Ionic, Corinthian, and Roman orders, the abacus has concave sides, with truncated angles. Square marble tablets let into walls, and fields with figures in them inserted in mosaic floors, were also included under the term abacus in ancient architecture.



ABACUS.
A—Gothic. B—Doric.

ABAD, ä-bäd′ (Pers. and Hind., equivalent to the Engl. *abode*). An affix in the formation of many Oriental geographical names, especially in British India and Persia, as Hyder*abad* (Haidarabad), the "dwelling" or city of Hyder.

ABAD or **ABBAD.** Name of an Arab family of Emesa, from which descended three Moorish princes of Seville known as Abadides. ABAD I. (Mohammed ibn Ismail Abu al-Kasim ibn Abad) founded the Abadide dynasty in Seville during the civil wars of the eleventh century. In 1023 the people of Seville revolted from the Caliph of Cordova, and Abad, cadi of the city, was called to the head of affairs. He soon seized absolute power, maintained his position against the efforts of the Caliph to bring the rebel province to submission, and added Cordova to his possessions. He died in 1042 and was succeeded by his son. ABAD II. (Abu Amr ibn Mutadid) was a cruel ruler, and carried on petty wars against his Moorish neighbors to extend his dominions. He was, however, forced to pay tribute by Ferdinand I., King of Castile and Leon. He died in 1068. ABAD III., his son (Mohammed ibn Abad, called Al-Mutamid), was a poet and patron of letters. He was tolerant, and peaceably added a part of Portugal to his kingdom. Alfonso VI. of Castile married his daughter, and the alliance roused the jealousy of the small Moorish princes, who joined with the Almoravides of Morocco in a league by which Mohammed and Alfonso were defeated. He died in a prison in Morocco in 1095. Mohammed's verses, written while in captivity, are greatly admired by Mohammedan readers. He was the last of the Abadides, whose reign ended in the conquest of the Almoravides.

ABAD′DON (Heb., "ruin," "destruction"). In the Old Testament, one of the names given to Sheol, or rather to the place of the lost in Sheol; only once used in the New Testament (Rev. ix. 11), and then as the proper Hebrew name of the King of the Abyss, whose Greek name is Apollyon. See APOCALYPTIC NUMBER.

ABAKA KHAN, ä-bä′kȧ hän′ *or* kän′. See MONGOL DYNASTIES.

ABAKANSK, ä′bȧ-känsk′. A fortified village in the Government of Yeniseisk, Siberia, on the right bank of the River Yenisei (Map: Asia, J 3). It was founded by Peter the Great in 1707, and is situated in a very fertile region in the vicinity of coal mines that give employment to many of its inhabitants. Pop., about 2000.

AB′ALO′NE (Sp., of unknown origin). A name in California for the several local species of marine gastropods (family Haliotidæ) otherwise known as ear-shells or sea-ears; representatives are numerous throughout the warmer seas of the world, except the western Atlantic. The shell, although having the shape of a shallow oval saucer, is really a widely flattened spiral, the apex of which is near one end, while the turned-over margin is the columella. (See illustrations on Plate of ABALONE, ETC.) The animal creeps about rocks near the shore, spreading a fringed mantle, and extending tentacles through the row of holes in its shell; it feeds upon seaweeds, and when quiet or alarmed withdraws all soft parts beneath the shield-like shell, and sits down with great tenacity, after the manner of its near relatives, the limpets. The lining of the shell is a layer of richly colored mother-of-pearl, much used for inlaying and for the manufacture of small ornaments, buttons, etc. The animals are eaten, especially by Orientals, and great quantities of them are collected and dried on the coast of California, not only for consumption by the local Chinese, but for export to China and Japan. A species in the Channel Islands, England, is regularly collected for food, and is called *ormer*.

ABANCAY, ä′bän-kī′. The chief city of the department of Apurimac, Peru, 50 miles west-southwest of Cuzco, on the Abancay (Map: Peru, C 6). It possesses extensive sugar refineries, and is the centre of the best sugar-growing district in Peru. There are also several silver mines in the neighborhood. Pop., 1896, 1200.

ABAN′DONMENT. The varying and dissimilar significations of this term, in different branches of the law, render a single definition of it impracticable. For its most important meanings in private law, see EASEMENT; INSURANCE; PATENTS, and PROPERTY. In criminal law, abandonment is the intentional exposure or desertion of a dependent person by one who is under a legal duty of protecting and maintaining him. A parent or a guardian of the person of a young child is guilty of a misdemeanor at common law if the child is physically injured in consequence of the abandonment; while if death results therefrom, the abandoning parent or guardian is guilty of murder. Even where no injury follows, abandonment of an infant is now generally punishable as a misdemeanor by statute. At present, the offense is generally defined by statute. In some States it has been extended to the abandonment of a disabled or infirm animal in a public place. Consult: Wharton, *Criminal Law* (Philadelphia, 1896); Bishop, *Commentaries on Criminal Law* (Boston, 1895).

ABANO, ä'bȧ-nō, Pietro D' (1250-1316). An Italian physician and astrologer, professor of medicine in Padua. He became famous through his work, *Conciliator Differentiarum, quæ inter Philosophos et Medicos Versantur* (Mantua, 1472), the object of which was to reconcile the philosophy and medicine of the time. His fame as a scientist and his enormous popularity as a physician aroused the envy of less successful men. Charges of heresy and atheism were brought against him, and he was arraigned before the Inquisition, but died in prison before the end of the trial.

ABARBANEL, ȧ-bär'bȧ-nĕl'. See Abrabanel.

AB'ARIM. An ancient name signifying probably the "parts beyond," and, when used with the article, applied to a range of mountains in the land of Moab, east of the Jordan and facing Jericho, which was plainly visible in the distance. The highest point of the range was Mount Nebo, the place where Moses closed his earthly career (Deuteronomy xxxii : 49).

AB'ARIS (Gk. Ἄβαρις). A legendary hyperborean miracle-worker, possessor of a magic arrow of Apollo, on which he could ride through the air. His story probably originated in the mystical movements of the sixth century B.C., though Abaris is first mentioned by Pindar and Herodotus. The New Platonists elaborated the legend and made Abaris a companion of Pythagoras.

ABASCAL, ä'bȧs-käl', José Fernando (1743-1821). A Spanish statesman and general. He entered the army in 1762; became Governor of Cuba in 1796; was Viceroy of Peru from 1806 to 1816; in 1816 he was made a marquis. He was noted for administrative ability, firmness, and moderation.

ABASIA, ȧ-bä'sē-ȧ. See Abkhasia.

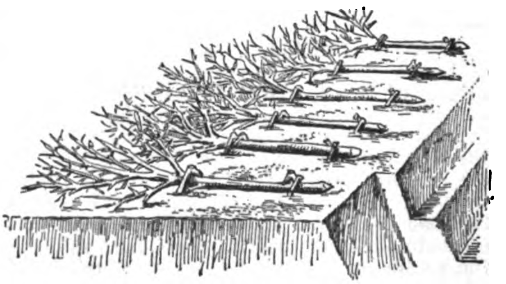
ABASOLO, ä'bȧ-sō'lō, Mariano (1780?-1819). A Mexican revolutionist, born at Dolores, Guanajuato. He participated in the revolution started by Hidalgo in 1810, and rose to be a major-general. He fought at Puente de Calderón, was taken prisoner by the Spaniards, was tried at Chihuahua, and was sentenced to ten years' imprisonment at Cadiz, where he died.

ABATE'MENT (O. F. lessening, from Lat. *a*, away + *batuere*, to beat). A term used in various senses in the common law of England and the United States, as follows: (1) *Abatement of Freehold*. The unlawful entry upon and taking possession of an estate of inheritance by a stranger after the death of the ancestor and before the heir or devisee has become seized of the estate by entry. See Freehold; Seisin. (2) *Abatement of Nuisances*. A remedy against injury by nuisance by removal of the nuisance. See Nuisance. (3) *Plea in Abatement*. A pleading interposed by the defendant to the plaintiff's complaint or declaration by which the defendant, on some formal and technical ground, seeks to abate or quash the action. If sustained it does not determine the merits of the controversy, but requires the plaintiff to begin his action anew. See Action; Pleading. (4) *Abatement of Legacies*. A reduction of the amount of legacies when the estate of the testator is insufficient to pay debts and legacies in full. See Legacy. (5) *Abatement of Suit*. Suspension of proceedings in a suit in Chancery for want of proper parties to proceed with the suit. Abatement may result from the death, change of interest of a party, or marriage of the plaintiff, if a woman. After abatement the suit may be revived and proceeded with by the legal representative of the deceased party, or by the husband of the plaintiff, if a woman. Action at law when abated could not be revived as in equity. This, however, is now permitted by statute. (See Action.) (6) *Abatement* or discount in commercial law. (See Discount.) (7) *Abatement* or deduction of duties levied by the customhouse. (See Customs Duties; Drawback.) (8) *Abatement* or reduction of taxes is regulated wholly by statute. See Tax.

ABATEMENT. In heraldry, an addition to the paternal coat of arms, to indicate some base or ungentleman-like act on the part of the bearer. The coat is then said to be abated, or lowered in dignity. Marks of abatement are repudiated by the best heraldic authorities. Menestrier calls them *sottises anglaises*, and Montagu is of opinion that we shall seek in vain for a more appropriate designation. Abatements are carefully to be distinguished from such subtractive alterations in coats of arms as signify juniority of birth, or removal from the principal house or senior branch of the family. These are commonly called marks of cadency, distinctions, differences, or brisures. The latter term is generally applied to marks of bastardy, though these are sometimes classed with abatements.

ABATI, ȧ-bä'tē, Niccolo dell'. See Abbate.

AB'ATIS (Fr. *abatis*, mass of crushed objects). A military defense, used for the purpose of retarding an enemy's advance. It is a device as old as the art of war itself, and still used under certain conditions, or in positions where wire entanglements are neither possible nor available. It consists of trees felled and placed side by side, the stronger boughs and branches intertwined, and pointed in the direction of the enemy. In the case of intrenchments of a more permanent character, the abatis is built in a



ABATIS.

slight depression in front of the trench or ditch, so that it is fairly safe from artillery fire.

ABATTOIR. As popularly regarded, the establishments in which animals are slaughtered for food are divided into large abattoirs and local slaughter-houses. The former are usually operated in cities in connection with packing houses, while the latter are chiefly found in country towns, and their products are sold in a fresh condition principally for local consumption.

The abattoir system of the United States is of comparatively recent origin, but with the concentration of the meat industry in large establishments it has developed rapidly and assumed enormous proportions. The packing house, of which the abattoir is an important part, has become the great source of meat for domestic consumption, and also for a heavy export trade. The methods followed in these establishments in the preparation of fresh meats and canned goods were the subject of much discussion in the public press during the summer of 1906. Investigation revealed unwholesome and unhealthy practices, unsanitary conditions, and the inadequacy of government inspection under existing laws. This led to the passage by Congress, June 30, 1906, of very drastic and comprehensive laws for the inspection of all meats intended for interstate or foreign trade and of all establishments producing the same, and providing an annual appropriation of $3,000,000 to maintain this Federal supervision. The prominence thus given to this subject makes an outline of the abattoir system, and the inspection of the animals before and after slaughtering, of special interest.

The largest abattoirs and the principal centres for meat packing are Chicago, Kansas City, Omaha, St. Louis, and Milwaukee. The Union Stock Yards in Chicago is the largest meat packing centre in the world, covering an area of about 500 acres, representing an invested capital of $67,000,000, and employing about 50,000 men. It is an aggregation of abattoirs, packing houses, and other establishments for handling live stock and utilizing the products. During the year 1905 there were received 7,725,738 hogs, 3,410,469 cattle, and 4,736,558 sheep, of which 74 per cent. of the hogs, 59 per cent. of the cattle, and 72 per cent. of the sheep were slaughtered, the remaining animals having been shipped to other points for Eastern slaughter, export, or feeding purposes.

At the Chicago Stock Yards the animals are received in cars direct from the feeding country. They are unloaded, fed, watered, and sold to the expert buyers employed by the packing companies. They are then subjected to an antemortem examination by the Government Inspectors, and those showing any diseased or unsound condition are tagged "rejected," subject to a postmortem examination.

In the slaughtering of animals the division of labor is carried out to a very fine degree, which renders possible the greatest skill and speed in the work. The cattle are driven up to the pens on the killing floor, situated several stories above the ground, and stunned by being "knocked" between and above the eyes with a sledge hammer. The animal then rolls out on the killing bed, is shackled, hoisted on the rails of a suspended tramway, and bled by a "sticker." After bleeding, it is moved along to a place where the "header" skins and removes the head. The animal is now lowered from the tramway and skinned, a constant string of butchers following one after another in completing the work and trimming out the dressed carcass. In the larger abattoirs there are from 16 to 32 beds. These beds are the portions of the killing floor opposite to each knocking pen, on which the animal is bled, eviscerated, and dressed. They are arranged in a continuous series, the first workmen starting out on the first bed and going down to the last, by which time the last workman has completed No. 1 carcass, which is then pushed back on the rail out of the way for the next run. In this manner a force of 50 butchers, 45 washers and trimmers, and 60 miscellaneous workers may kill and dress about seven runs of cattle in an hour, which means an average of from 1100 to 2000 beef carcasses for a day of 10 hours.

During the slaughtering the carcasses are inspected by the Federal meat inspectors. These latter officials follow the "gutter" and inspect the viscera, carefully examining all suspicious indications of disease and loathsome conditions. In case lesions of a serious disease are found, or if the animals are emaciated, advanced in pregnancy, have recently given birth to young, or are immature, the carcass is marked with a tag bearing the letters "U. S. Condemned" and is rendered into fertilizer, thus protecting the public from the danger of ingesting unsound or diseased meat. Those carcasses which fail to reveal conditions which would render the meat unfit for food, are marked "U. S. Inspected and Passed."

With the hogs the process of slaughtering is necessarily somewhat different. In the large packing houses the animals are driven into the catch pens, a chain is passed around the hind leg and attached to one of a series of arms on a constantly moving so-called Ferris wheel which elevates the pig and deposits it on an inclined rail where its weight carries it to the "sticker" who severs the large blood vessel in the neck. As soon as the animal is dead it is placed into the scalding tank through which it passes by a revolving motion and at the opposite end is lifted out by a cradle and drawn through the automatic scraping machine which removes most of the bristles. The scraping is completed by hand on the scraping bench after which the head is almost completely severed from the body. It is at this point that the first Government inspector examines the cervical glands of every animal. The carcass is then hung on the track of a suspended tramway and here eviscerated, during which process it is inspected by the second U. S. meat inspector, and the normal carcasses are then passed along the rail through the shower bath into the cooling room. In cases where lesions are observed, the viscera together with the carcasses are tagged and switched to a special rail in the cooling room. Before the ultimate disposition of these tagged carcasses is determined upon a final examination is made by a third Government inspector.

The killing and dressing of the animals however is but a small percentage of the work done in the abattoir. There are large cutting rooms where the carcasses go from the cooling room to be cut into the various pieces, also curing and smoking rooms for the treatment of these cuts of meats. The making of leaf and steam lard and sausage manufacturing are large industries of themselves. See Meat; and for an account of meat inspection and the law of 1906, see Packing Industry.

ABAUZIT, á'bô'zē', Firmin (1679-1767). A French scholar. He was born in Languedoc and died at Geneva. His parents were Protestants, and at the revocation of the Edict of Nantes he was sent to Geneva. Here he studied diligently, and became versed in almost all the sciences. He traveled in England and Holland in 1698. William III. wished to retain him permanently in England, but his affection for his mother induced him to return to Geneva. He translated the New Testament into French in 1726, and for his lucid investigations into the ancient history of Geneva he received from its authorities the rights of citizenship. He was the author of numerous theological and archæological treatises. His orthodoxy has been disputed. Rousseau, who could not bear to praise a contemporary, penned his solitary panegyric on Abauzit in the *Nouvelle Héloïse*. In the course of his long life Abauzit became the friend of Newton, Bayle, and Voltaire.

AB'BA (Gk. ἀββᾶ). The Aramaic form of the Hebrew word for father. It occurs three times in the New Testament as a form of address to the Deity (Mark xiv : 36; Rom. viii : 15; Gal. iv : 6), where its meaning in Greek is added, for the benefit of readers unfamiliar with Hebrew. In Talmudic literature it occurs frequently as a title of honor addressed to a scholar, and also enters into the composition of proper names. The title Abba is frequently met with in ecclesiastical literature and is applied to the bishops of the Syriac, Coptic, and Ethiopic Churches.

ABBADIE, á'bá'dē', Antoine Thomson d' (1810-97), and Arnaud Michel d' (1815-93). Two French explorers, brothers, born in Dublin. They were known for their researches in Abyssinia, from 1837 to 1845. According to their own account, their objects were purely ethnological and geographical; but they were regarded by certain English travelers and missionaries as agents employed by the French Government for religious and political purposes. Among the results of their travels were a catalogue of Ethiopic MSS., an edition of the Ethiopic version of the *Pastor* of Hermas, and the *Géodésie de la Haute-Ethiopie* (1860-73). The English expedition to Abyssinia led Arnaud to publish, in 1868, his *Douze ans dans la Haute-Ethiopie*. Antoine published a *Dictionnaire de la langue Amarinna* in 1881.

ABBADIE, Jacques (1654?-1727). A French Protestant theologian, who died in London. Of a poor family, he was educated by his friends, and advanced so rapidly that at seventeen he was granted the degree of doctor of theology at Sedan. He spent several years in Berlin as minister of the French Protestant church, and in 1688 accompanied Marshal Schomberg to England, becoming minister of the French church in London called "La Savoye." He was strongly attached to the cause of William III., who made him dean of Killaloe, Ireland. He wrote a defense of the English revolution of 1688, but was best known by his theological works, the most important of which was *Traité de la vérité de la religion chrétienne* (1684).

ABBAS I., ăb'bás (1557-1628). Shah of Persia; known as "the Great." He was the youngest son of Shah Mohammed Khodabendeh. He rose in rebellion against his father and gained possession of the throne at the age of eighteen. In 1597 he defeated the Uzbeks in a great battle near Herat, and drove them from the country. During many campaigns against the Turks he added a great deal of territory to his possessions. He overthrew the Turks and Tartars near Sultanieh and extorted an advantageous peace from them (1618). Upon the renewal of hostilities he captured Bagdad after a year's siege, in 1623. His reign was marked by the magnificence of his court and by the many important reforms which he introduced. See Persia.

ABBAS I., PASHA, ăb'bás pá-shä' (1813-54). Viceroy of Egypt and grandson of Mehemet Ali. He was active but not distinguished in Mehemet's wars in Syria. After Ibrahim's short reign, he took the throne (1848) as hereditary successor, and proved a cruel and capricious ruler. He dismissed all Europeans from State service, and in general was a foe to civilization. In the Crimean War he assisted the Sultan of Turkey with his fleet and 15,000 men. It is supposed that he was murdered.

ABBAS II., Hilmi (1874—). Khedive of Egypt; eldest son of Tewfik Pasha. He was educated at Vienna, and succeeded his father in 1892. Though his attitude toward England in Egypt is unfriendly, he has carried on his government under British supervision since his abortive attempt to form an anti-British cabinet (1893). See Egypt.

ABBAS Ibn Abd al Muttalib, ăb'bás 'b'n ăbd' ĕl mōōt-tä'lĕb (566-652). Paternal uncle of Mohammed. He was at first a determined opponent of his nephew, but his defeat in battle at Bedr was followed by his conversion, after which he became one of the chief apostles of Islamism. He was the progenitor of the Abbasside caliphs of Bagdad.

ABBAS-MIRZA, ăb'bás mēr'zá (1783-1833). A Persian prince, the son of Fath Ali Shah. He possessed great ability, and was a friend of Western civilization. As provincial Governor of Azerbijan, he applied himself, with the aid of English officers, to the reform of the army. He commanded the main Persian army in the unsuccessful war with Russia, which was concluded by the peace of Gulistan in 1813, when Persia lost its remaining possessions in the Caucasus, and was forced to acknowledge the flag of Russia on the Caspian Sea. At the instigation of Abbas, a new war broke out in 1826, between Fath Ali and Russia. The Prince fought a second time with extraordinary bravery at the head of the army, but was again obliged to yield to the superiority of the Russian arms, and to conclude a peace, on February 22, 1828, at Turkmanchai, by which Persia lost most of her Armenian territory. In this treaty, Russia guaranteed to Abbas the succession to the Persian throne. When, in 1829, the Russian ambassador at Teheran was murdered in a popular tumult, which he had provoked by his own imprudence, Abbas went in person to St. Petersburg, to prevent any ill consequences, and to maintain the peace. He was received by the Emperor with kindness, and went back to Persia loaded with presents. His eldest son, Mohammed Mirza, mounted the throne in 1834. See Persia.

ABBAS'SIDES, The (Ar. *al-'Abbasiyah*). Caliphs of Bagdad, and the most celebrated Moslem dynasty, although their rule never extended over the whole of Islam, as had that of the Ommiads (q.v.). It was never acknowledged in Spain and only nominally in Africa outside of Egypt. Theirs was, however, the true caliphate, notwithstanding the rival claims of Cordova. The Abbassides claimed descent from Abbas, the uncle and adviser of Mohammed (566-652 A.D.). The rivalry between the family of Abbas and the Ommiads broke out into open war. In 747 Ibrahim, the head of the Abbasside faction, was overthrown by the Caliph Merwan and put to death, but three years later his brother, Abu al-Abbas, who had proclaimed himself rightful Caliph, defeated Merwan in a great battle near the river Zab and established his line firmly on the throne. In Spain, however, Abd al-Rahman, one of the Ommiads, who had escaped from the general destruction of his house, succeeded in establishing the great independent emirate, or kingdom (subsequently caliphate) of Cordova. It was long before the rulers of Spain assumed the title of Caliph. The successor of Abu al-Abbas, Almansur, made Bagdad the capital of his empire. Under his followers the empire enjoyed comparative peace and attained to a splendid development. The caliphs became the patrons of literature, art, and learning, and their courts were the homes of the most extreme luxury. The caliphs Harun al-Rashid (786-809) and al-Mamun (813-833) were famous throughout the world for their wealth, their splendor, and their munificence. But the martial vigor of the Arabs was sapped by the influence of Persian luxury, and they gradually ceased to be relied upon for military service. In Africa and in the northeastern part of Persia, emirs seized the opportunity to declare themselves independent; in the west the Greek Empire showed a revival of energy; but the real danger came, as with the Roman Empire, from an alien soldiery. Mutasim (833-842) had formed a body-guard of Turks, and these in time seized upon the real powers of government. They assassinated Mutawakkil, the son of Mutasim, in 861, and in the following century forced the caliphs to delegate the chief powers of government to their commander. Gradually the empire of the Abassides became contracted, until it was finally narrowed down to Bagdad and the surrounding territory. In 1258 Hulaku Khan, the Mongol ruler of Persia, burned Bagdad and put the ruling Caliph to death. Deprived of all political power, the Abbassides found refuge with the Mameluke rulers of Egypt, who paid them respect as the spiritual heads of the Mohammedan world. The last of the Abbassides, Mutawakkil III., died in 1538 at Cairo, where he was living under the protection of the Turkish Sultan. Consult: Muir, *The Caliphate* (London, 1891); Syed Ameer Ali, *A Short History of the Saracens* (New York, 1899); and the more elaborate work, Weil, *Geschichte der Chalifen* (Mannheim and Stuttgart, 1846-62).

ABBATE, äb-bä'tȧ, or **ABATI**, ȧ-bä'tē, Niccolò dell' (1512-71). An Italian painter, who was born at Modena and died at Fontainebleau. He was an able and skillful artist in fresco-painting, and was a follower both of Raphael and Correggio; yet he rather blended the two styles in one than imitated either separately. His earlier works are to be seen at Modena, his later ones at Bologna, among which is his "Adoration of the Shepherds," considered his finest; but he is best known by the frescoes which he executed for the palace of Fontainebleau, from the designs of Primaticcio. His "Martyrdom of St. Peter and St. Paul" is in the Dresden Gallery.

ABBAZIA, ä'bȧ-tsē'ȧ. An Austrian health resort, charmingly situated at the head of the Gulf of Quarnero (Adriatic Sea), nine miles west-northwest of Fiume (Map: Austria, D 4). Well sheltered, Abbazia is a favorite summer and winter resort, with a mean temperature of 50° F. in winter and 77° F. in summer. It has a Kurhaus, various bathing institutions, and the Carol Promenade, built in 1896 at the expense of the King of Rumania. The population is (1900) 2341, mostly Croats.

ABBÉ, ȧ'bȧ'. The French name for an abbot (q.v.), but often used in the general sense of an unbeneficed Roman Catholic priest. By the famous Concordat of Bologna between Pope Leo X. and Francis I. (August 18, 1516), the French king had the right to nominate upward of 200 *abbés commendataires*, who, without having any duty to perform, drew a considerable proportion of the revenues of the convents. The hope of obtaining one of those sinecures led multitudes of young men, many of them of noble birth, to enter the clerical career, who, however, seldom went further than taking the inferior orders (see Orders, Holy); and it became customary to call all such aspirants abbés—jocularly, "abbés of St. Hope." They formed a considerable and influential class in society; and an abbé, distinguished by a short black or violet-colored frock, and a peculiar style of wearing the hair, was found as friend or ghostly adviser in almost every family of consequence. When a candidate obtained an abbey, he was enjoined to take holy orders; but many procured dispensation, and continued to draw the revenues as secular or lay-abbots. In Italy the same class of unbeneficed clergy are called *abbate*.

AB'BE, Cleveland (1838—). An American astronomer, meteorologist, and educator, born in New York City. He graduated in 1857 at the Free Academy (now the College of the City of New York), and studied astronomy with F. Brünnow at Ann Arbor (1858-60) and with B. A. Gould at Cambridge (1860-64). From 1864 to 1866 he resided at the observatory at Pulkova, Russia, and from 1868 to 1873 was director of the Cincinnati Observatory, where he inaugurated a system of daily weather forecasts based upon simultaneous meteorological observations reported by telegraph. This led to the establishment of a similar system by the Government. In December, 1870, Professor Abbe was called to Washington to prepare the official weather predictions and storm warnings, and in 1891 he was appointed meteorologist of the Weather Bureau. To him is due the initiation in May, 1879, of the movement toward the introduction of the present system of standard time and hourly meridians. In January, 1873, he prepared the first official *Monthly Weather Review*, which has continued under his editorship. He is professor of meteorology in Columbian University, Washington, lecturer on meteorology in Johns Hopkins University, Baltimore, and a member of the National Academy of Sciences. He received the degree of LL.D. from the University of Michigan in 1887, and from the University of Glasgow in 1896. He published the *Annual Summary and Review of Progress in Meteorology* (1873-88); *Treatise on Meteorological Apparatus and Methods* (1887); *Preliminary Studies for Storm and Weather Predictions* (1889); *The Mechanics of the Earth's Atmosphere* (1891), *Physical Basis of Long Range Forecastings* (1902).

ABBE, äb'b*e*, ERNST (1840-1905). A German physicist. He was born at Eisenach, Thuringia; studied at Jena and Göttingen; became assistant at the astronomical observatory in Göttingen and lecturer before the Physical Society of Frankfort-on-the-Main. In 1870 he was made professor at Jena; in 1878 became director of the astronomical and meteorological observatories, but resigned his ordinary professorial duties in 1891, when he became sole proprietor of the Carl Zeiss optical works in Jena, with which he had been connected since 1866. This he made a co-operative establishment, in the profits from which the officials, the workmen, and the university share. Abbe is well known for the part he played in the design and perfection of optical instruments. The high degree of excellence of the instruments and lenses manufactured by his firm is largely the result of his experimental work. Especially has the improvement been marked in photographic and microscopic lenses. He invented the Abbe refractometer and wrote papers on optics and optical instruments. See his *Gesammelte Abhandlungen* (Jena, 1904).

AB'BESS. The superior of a religious community of women, who corresponds in rank and authority to an abbot (q.v.), except that she is not allowed to exercise the spiritual functions of the priesthood—such as preaching, confession, etc. Nor can she release her nuns from their vows or suspend or dismiss them. Her personal confessor and those for her nunnery must be approved by the bishop. The Council of Trent decreed that her electors must be professed nuns and that she must be at least forty years old and an inmate of the nunnery over which she was to preside for at least the eight previous years.

ABBEVILLE, ȧb'vêl' (Fr., "city of the Abbey," of St. Riquier). Capital of the arrondissement of Abbeville, in the department of Somme, France (Map: France, H 1). Abbeville is built partly on an island, and partly on the banks of the River Somme. The streets are narrow, and the picturesque houses are built mostly of brick and wood. The building most worthy of notice is the church of St. Wolfran, commenced in the reign of Louis XII., a splendid example of the flamboyant style. Its city hall, built in 1209, is a curious mediæval structure; the library, containing 45,000 volumes, dates from 1690. The chief manufactures of Abbeville are velvets, serges, cottons, linens, sacking, hosiery, jewelry, soap, glassware, glue, paper, etc. It is on the Northern Railway, and is connected by canals with Amiens, Paris, Lille, and Belgium. Vessels of between 150 and 200 tons can sail up the Somme as far as Abbeville, which is twelve miles from that river's mouth in the British Channel. Abbeville is well known in the scientific world from the remarkable fossil remains of extinct mammals, as well as the flint implements of prehistoric man, which have been discovered in its neighborhood. Pop., 1896, 17,781; 1901, 20,388.

ABBEVILLE, ăb'bê-vĭl. A town and county seat of Abbeville Co., S. C., 105 miles west of Columbia, on the Southern and the Seaboard Air Line railroads (Map: South Carolina, B 2). The principal industries are cotton-ginning, cottonseed oil pressing, flour and feed milling, the manufacture of cotton cloth, and brickmaking. Pop., 1890, 1696; 1900, 3766.

ABBEVILLE (äb'vêl') **TREATIES.** Louis IX. of France appears to have doubted the validity of his title to some of the former possessions of the English princes; and so after seventeen years of intermittent discussion the difficulty was settled in a treaty of peace with Henry III. This treaty, named from Abbeville, where the two kings met, and dated May 20, 1259, was in reality negotiated with Earl Simon de Montfort at Paris and concluded with Henry during his visit to France, November, 1259, to April, 1260. By its terms Henry surrendered all claim to Normandy, Touraine, Maine, Anjou, and northern Saintonge; receiving from Louis in return Périgord, Limousin, southern Saintonge, and some other territory south of the Loire, to be held as fiefs. Henry gave up the titles of Duke of Normandy and Count of Anjou; while as Duke of Guienne and peer of France he agreed to do homage to the French monarch, this engagement being performed in the Garden of the Temple at Paris. The inhabitants of the districts ceded to Henry were ill pleased, and in later times they refused to celebrate the saint-day of Louis. A treaty between Henry VIII. and Francis I. was made at Abbeville in 1527. The negotiations on the part of England were conducted by Wolsey.

AB'BEY. See MONASTERY; SANCTUARY.

ABBEY, EDWIN AUSTIN (1852—). An American figure painter, whose first successes were in the field of illustration. He was born in Philadelphia, studied at the Pennsylvania Academy of the Fine Arts, and afterward worked in New York until 1878, when he removed to England. He was for many years best known as an illustrator for the periodicals and as a painter of water colors. His illustrations of Herrick's poems and Shakespeare's plays are most widely known; among other illustrated editions are *She Stoops to Conquer*, *Old Songs*, and *Who is Silvia?* Although dealing almost entirely with literary subjects, his canvases are of high artistic merit. They include "A May-Day Morning" (1890), "Fiametta's Song" (1894), and "Crusaders Sighting Jerusalem." In 1901 he was commissioned to paint the coronation of Edward VII. His most important work in the United States is "The Quest of the Holy Grail" (1891-1902), a series of large panels on the walls of the delivery room of the Boston Public Library. Later works are a "Potpourri" (1903), "A Measure" (1904), and a panel for the Royal Exchange of London (1905). He has also produced some very individual work in pastel, full of sentiment and color. His works are distinguished by careful archæological accuracy, fine sentiment, and a strong feeling for color. He may be ranked among the strongest colorists and the most intellectual painters America has produced. He is Chevalier of the Legion of Honor, and a member of the National Academy, New York, the Royal Academy, London, and other foreign societies.

ABBEY, Henry (1842—). An American poet and merchant, born at Rondout, N. Y. He is the author of *May Dreams, Ralph and Other Poems, Stories in Verse, Ballads of Good Deeds, The City of Success*, and *Phaëton*. His works are collected in *Poems of Henry Abbey*, of which there are three editions.

ABBIATEGRASSO, ȧb-byä'tȧ-gräs'sō. A city in north Italy, 394 feet above the sea, on the Grande and Bereguardo canals, and 16 miles west of Milan (Map: Italy, C 2). It manufactures fertilizers and markets rice. It was captured in 1167 by Emperor Frederick I., and in 1245 by Emperor Frederick II. In 1313 Matteo Visconti vanquished the Guelphs here, and in 1524 Giovanni de' Medici the French. Pop., 1901, 12,270.

AB'BITIB'BIE, or **ABBITIBBE.** A Canadian river and lake. The river flows northward to James Bay in Hudson Bay, and is the outlet of the lake which is situated in latitude 49° N., with a trading station of the same name upon its shores.

AB'BO OF FLEURY, flĕ'rē' (Abbo Floriacensis) (945?-1004). A French theologian. He studied at Rheims and Paris, and at the request of Oswald, Archbishop of York, taught in 985-987 in the English abbey of Ramsey. When he returned to France he was chosen Abbot of Fleury, whose school he developed. He was sent by King Robert upon a diplomatic mission to Pope Gregory V., and was killed at the priory of La Réole, Gascony, in an uprising against his reforms in monastic discipline. He wrote an *Epitome de Vitis Romanorum Pontificum, Desinens in Gregorio I.* (printed in 1602). His biography was written by his pupil Aimoin in the *Vita Abbonis abbatis Floriacensis*.

AB'BOT (through Lat. *abbas*, Gk. *ἀββᾶς*, *abbas*, from Syriac *abbā*, father). A name originally given as a term of respect to any monk, especially to one noted for piety, but afterward ordinarily applied to the superior of a monastery or abbey. The first abbots were laymen, as the monks were, but in the Eastern Church priestly abbots appear in the fifth century, and in the Western Church in the seventh, and such ordained abbots are now the rule. After the second Nicene Council (787), abbots were empowered to consecrate monks for the lower sacred orders; but they remained in subordination under their diocesan bishops until the eleventh century. They exercised absolute authority over their monasteries. As abbeys became wealthy, abbots increased in power and influence; many received episcopal titles; and all were ranked as prelates of the Church next to the bishops, and had the right of voting in Church councils. Even abbesses contended for the same honors and privileges, but without success. In the eighth and ninth centuries, abbeys began to come into the hands of laymen, as rewards for military service. In the tenth century many of the chief abbeys in Christendom were under lay-abbots (*abbates milites*, or *abba-comites*), while subordinate deans or priors had the spiritual oversight. The members of the royal household received grants of abbeys as their maintenance, and the king kept the richest for himself. Thus, Hugo Capet of France was lay-abbot of St. Denis, near Paris. Sometimes convents of nuns were granted to men, and monasteries to women of rank. These abuses were, in great measure, reformed during the tenth century. After the reformation of the order of Benedictines, monasteries arose that were dependent upon the mother-monastery of Clugny and without abbots, being presided over by *priors* or *pro-abbates*. Of the orders founded after the eleventh century, only some named the superiors of their convents abbots; most used the titles of prior, major, guardian, rector. Abbesses have almost always remained under the jurisdiction of their diocesan bishop; but the abbots of independent or liberated abbeys acknowledged no lord but the Pope. In the Middle Ages, the so-called *abbates mitrati* frequently enjoyed episcopal titles, but only a few had dioceses. Before the period of secularization in Germany, several of the abbots in that country had princely titles and powers. In England there were a considerable number of *mitred abbots* who sat and voted in the House of Lords. The election of an abbot belongs, as a rule, to the chapter or assembly of the monks, and is afterward confirmed by the Pope or by the bishop, according as the monastery is independent or under episcopal jurisdiction. At the time he must be at least twenty-five years of age. From early times, the Pope in Italy has claimed the right of conferring abbacies, and the Concordat of Bologna (August 18, 1516) between Francis I. and Pope Leo X. gave that right to the king of France. Non-monastic clergy who possessed monasteries were styled *secular abbots;* while their vicars, who discharged the duties, as well as all abbots who belonged to the monastic order, were styled *regular abbots*. In France, the abuse of appointing secular abbots was carried to a great extent previous to the time of the revolution of 1789 (see Abbé); indeed, often monasteries themselves chose some powerful person as their secular abbot, with a view of "commending" or committing their abbey to his protection, and such lay-abbots were called *abbés commendataires*. In countries which joined in the Reformation of the sixteenth century the possessions of abbeys were mostly confiscated by the crown; but in Hanover, Brunswick, and Württemberg several monasteries and convents were retained as educational establishments. In the Greek Church, the superiors of convents are called *hegumeni* or *mandrites*, and general abbots, *archimandrites*.

ABBOT, Benjamin, LL.D. (1762-1849). A New England teacher, who had among his pupils Jared Sparks, Daniel Webster, George Bancroft, Edward Everett, and others who became famous. For nearly fifty years (until 1838), he was at the head of Phillips Academy, Exeter, N. H.

ABBOT, Charles, first Baron Colchester (1757-1829). A Speaker of the House of Commons. He was born at Abingdon and was educated at Christ Church. After he had occupied numerous positions under the Government he became Speaker of the House (1802) and held the office until 1816, when ill health compelled him to resign. He was one of the ablest Speakers that ever occupied the chair, and also rendered valuable services as a trustee of the British Museum. His valuable *Diary and Correspondence* was published by his son in 1861.

ABBOT, Ezra (1819-84). An American biblical scholar. He was born at Jackson, Waldo Co., Me., and died at Cambridge, Mass. After graduation at Bowdoin College (1840) he taught school in Maine and in Cambridge, Mass., until in 1856 he became assistant librarian of Harvard University. From 1872 till his death he was Bussey Professor of New Testament Criticism and Interpretation in the Divinity School of Harvard University. He received the degrees of LL.D. (Yale, 1869; Bowdoin, 1878); S.T.D. (Harvard, 1872); D.D. (Edinburgh, 1884). His industry, classical scholarship, wide acquaintance with books, and rare capacity for retaining minute information made him a remarkable bibliographer and textual critic. He won fame in the first direction by his valuable *Literature of the Doctrine of the Future Life* (1864), appended to W. R. Alger's book on the subject, and by his bibliographical additions to *Smith's Bible Dictionary* (American edition, Boston, 1867-70, 4 volumes), though the value of the additions is not commensurate with their number, as no critical distinctions were made between the books whose titles were so accurately given. But much wider was his fame in the second direction, for his acquaintance with the text of the Greek New Testament was recognized throughout the biblical world, and gave him a place beside Lachmann, Tischendorf, Tregelles, Scrivener, Westcott, and Hort. He was therefore an efficient member of the American New Testament Revision Company (1871-81), and enabled it to boast textual scholarship equal to the British. Into the revision he put the most painstaking and accurate learning. He displayed his attainments in ways which won him the hearty thanks of the authors he aided, but not much public recognition. Thus he was the coadjutor of Caspar René Gregory upon his prolegomena to the eighth major edition of Tischendorf's Greek New Testament (Leipzig, 1884-94, 3 parts); he revised the whole of Schaff's *Companion to the New Testament* (New York, 1883); and greatly enriched E. C. Mitchell's *Critical Handbook of the New Testament* (New York, 1880). His modesty made him indifferent to fame, and he put his strength upon correcting other people's books and upon monographs which the scholarly world appreciated. These latter have been collected by J. H. Thayer, and are published under the caption, *Critical Essays* (Boston, 1888). Consult Barrows' sketch of *Ezra Abbot* (Boston, 1884).

ABBOT, Francis Ellingwood (1836-1903). An American writer on philosophy. He was born in Boston, Mass., and graduated at Harvard University (1859) and the Meadville Theological School (1863). After having had charge of Unitarian congregations from 1863 to 1868, he turned to journalism, and from 1870 to 1880 edited a weekly journal, the *Index*, devoted to religious topics. He published *Scientific Theism* (1886), and *The Way Out of Agnosticism* (1890).

ABBOT, George (1562-1633). Archbishop of Canterbury. He was born at Guildford, Surrey, and was educated at Oxford (B.A. 1582; M.A. 1585; D.D. 1597). He took holy orders in 1585 and rose rapidly. His pronounced Puritanism brought him into conflict with William Laud. In 1609 he was appointed Bishop of Coventry and Lichfield, and in 1610 he was translated to the see of London. In 1611 he was enthroned Archbishop of Canterbury. He owed these successive appointments to the marked favor of James I., and used his exalted position to advance a narrow Protestantism and to persecute Roman Catholics. He also appeared in political life as the determined foe of Spain and France, largely because they were Roman Catholic countries. His courageous opposition to the King on several momentous occasions cost him after 1613 much of the royal favor. While under a cloud he had the misfortune, when hunting, accidentally to kill a gamekeeper. His enemies used the incident against him. Laud brought about a court of inquiry into the alleged infringement of canon law, and three persons designated to bishoprics refused to be consecrated by him. The inquiry came to nothing, but the stigma remained. The death of James I. (1625) was an additional misfortune to Abbot, as Charles I. was influenced by Laud. After 1627 he was practically deprived of the rights and privileges of his office. He died at Croydon, then the country residence of the Archbishop of Canterbury, August 4, 1633. Of his writings the most popular was his commentary on the Book of Jonah (1600), which was reprinted with a life by Grace Webster (London, 1845).

ABBOT, Henry Larcom (1831—). An American soldier and engineer. He was born at Beverly, Mass., and graduated at the United States Military Academy, West Point, in 1854, entering the corps of engineers, in which he served with distinction until his retirement in 1895. He was engaged in the survey for the Pacific Railroad and the hydrographic survey of the Mississippi River delta. During the Civil War he was engaged in engineering and artillery operations. He was wounded at the battle of Bull Run in 1861. In the operations around Richmond he commanded the siege artillery. At the close of the war he was brevetted Brigadier-General of United States Volunteers, and Major-General of the United States Army. For many years he was in command of the garrison of engineers at Willetts Point, N. Y., and while there developed the torpedo and submarine defense of the Long Island Sound approach to New York City and founded the school for engineers. In this connection he did much important work in military science, devoting himself to the design and construction of submarine mines and mortar batteries, as well as to the development of military engineering equipment and drill, and serving on the Gun Foundry Board, the Board on Fortifications and Defenses, and numerous other military commissions. He was a member of the board to devise a plan for the protection and reclamation of the Mississippi basin. In 1872 he was elected a member of the National Academy of Sciences. He served as president of a board of consulting engineers to consider the question of a proposed ship canal from Pittsburg to Lake Erie, and designed the harbor at Manitowoc, Wis. In May, 1897, he was appointed a member of the Technical Committee of the New Panama Canal Company. He is the author of *Siege Artillery in the Campaign Against Richmond* (1867); *Experiments and Investigations to Develop a System of Submarine Mines for Defending Harbors of the United States* (1881), and with General A. A. Humphreys, *Physics and Hydraulics of the Mississippi*, in addition to a large number of reports of military and engineering commissions and boards.

ABBOT, Joseph Hale (1802-73). An American educator, born at Wilton, N. H. He graduated in 1822 at Bowdoin College, and from 1827 to 1833 was professor of mathematics and an instructor in modern languages at Phillips Academy, Exeter. He contributed numerous valuable papers to the *Transactions* of the American Academy of Arts and Sciences, and was an associate editor of Worcester's *Dictionary of the English Language* (1860).

ABBOT, Samuel (1732-1812). An American philanthropist. He was born at Andover, Mass., and was one of the founders of the Andover Theological Seminary, to which he gave $20,000 in 1807 and $100,000 more in his will. He was a successful merchant of Boston and a large contributor to charities.

ABBOT, The. The title of one of Sir Walter Scott's novels, published in 1820. Its incidents form a sequel to *The Monastery*, and are based upon the history of Mary, Queen of Scots, in the years 1567 and 1568, ending with the battle of Langside and her escape to England.

ABBOT, Willis John (1863—). An American author and editor, grandson of John S. C. Abbott. He was born at New Haven, Conn., and graduated at the University of Michigan in 1884. He is best known by his *Blue Jackets of '61, Blue Jackets of 1812,* and *Blue Jackets of '76,* a series of stories for boys relating to the naval history of the United States, and by his *Battle Fields of 1861.* Mr. Abbot was managing editor of the Chicago *Times* in 1892 and 1893, and from 1896 to 1898 was on the editorial staff of the New York *Journal.*

ABBOT OF JOY (Abbé de Liesse). The title bestowed upon the chief of a brotherhood founded at Lille. Accompanied by a suite of officers and servants who bore before him a standard of red silk, he presided over the games which were held at Arras and the neighboring towns during the period of the carnival, coming under the general title of "Feast of the Ass" (q.v.). See also Misrule, Lord of.

AB′BOT OF MISRULE′. See Misrule, Lord of.

AB′BOTSFORD. The estate of Sir Walter Scott, situated on the south bank of the Tweed, about three miles from Melrose Abbey. Before it became, in 1811, the property of Scott, the site of the house and grounds of Abbotsford formed a small farm known as Clarty Hole. The new name was given it by the poet in remembrance of the days when Melrose abbots passed over the fords of the Tweed. On this spot, a sloping bank overhanging the river, with the Selkirk Hills behind, he built at first a small villa, now the western wing. He added the remaining parts of the building, on no uniform plan, but with the desire of combining some of the features (and even actual remains) of those ancient works of Scottish architecture which he most loved. The result was a picturesque and irregular pile, which has been aptly called "a romance in stone and lime." It has remained in Scott's family now to the fourth generation. See Irving's *Abbotsford* (London, 1850); Lockhart's *Life of Scott* (Edinburgh, 1838); Mary Scott's *Abbotsford* (New York, 1893), and Smith and Crockett's *Abbotsford* (New York, 1905).

AB′BOTT, Austin, LL.D. (1831-96). An American lawyer, born in Boston, Mass., the son of Jacob Abbott. He graduated at the University of the City of New York in 1851 and was admitted to the bar in the following year. He was in partnership with his brothers, Benjamin Vaughan and Lyman (afterward editor of the *Outlook*). He gained a national reputation as counsel for Theodore Tilton in his suit against Henry Ward Beecher. He aided his brother Benjamin in the preparation of his well-known digests of laws, and published many legal text books. He also wrote, in collaboration with his two brothers, two novels, *Matthew Caraby* and *Conecut Corners.* He was an able lecturer on law and was Dean of the Law School of the University of the City of New York from 1891 until his death.

ABBOTT, Benjamin (1732-96). A Methodist Episcopal minister, born on Long Island, N. Y. He was apprenticed to a hatter in Philadelphia, and subsequently to a farmer in New Jersey. He was converted from a dissipated life when about 40 years old, and immediately became an itinerant Methodist preacher. After sixteen years' service in New Jersey he was assigned to the Dutchess (N. Y.) circuit in 1789. He was transferred to the Long Island circuit in 1791, to Salem, N. J., in 1792, to the Cecil circuit, Maryland, as presiding elder, in 1793, and died at Salem, N. J., in 1796. He was famous in his day, and is still remembered as a "rousing" preacher. His vehemence was such that he frequently fainted, and generally raised a commotion among his hearers.

ABBOTT, Benjamin Vaughan (1830-90). An American lawyer, the son of Jacob Abbott. He graduated at the University of the City of New York in 1850, and was admitted to the bar in 1852. In legal practice his brothers Austin and Lyman were associated with him. He produced nearly 100 volumes of reports and digests of Federal and State laws. In 1865, as secretary of the New York Code Commission, he drafted a penal code which, when adopted by the Legislature, became the basis of the present code. In 1870 President Grant appointed him one of three commissioners to revise the statutes of the United States.

ABBOTT, Charles Conrad (1843—). An American archæologist and naturalist, born at Trenton, N. J. He studied medicine at the University of Pennsylvania, and served as a surgeon in the Federal Army during the Civil War. From 1876 to 1889 he was assistant curator of the Peabody Museum in Cambridge, Mass., to which he presented a collection of 20,000 archæological specimens, and he has given freely to other archæological collections. His book *Primitive Industry* (1881) detailed the evidences of the presence of pre-glacial man in the Delaware Valley, and is a valuable contribution to archæology. He has also published many books on out-door observation, such as *A Naturalist's Rambles About Home* (1884). His other works, besides some fiction, include: *Upland and Meadow* (1886); *Wasteland Wanderings* (1887); *Outings at Odd Times* (1890); *Clear Skies and Cloudy* (1899); and *In Nature's Realm* (1900).

ABBOTT, Edward, D.D. (1841—). An American clergyman, journalist, and author, born at Farmington, Me. He graduated in 1860 at the University of New York, studied from 1860 to 1862 at the Andover Theological Seminary, and in 1863 served in the United States Sanitary Commission at Washington and with the Army of the Potomac. He was ordained in 1863 to the Congregational ministry, and was pastor of Pilgrim Church, Cambridge, Mass., from 1865 to 1869. From 1869 to 1878 he was associate editor of the *Congregationalist*, and from 1878 to 1888 editor of the *Literary World*, whose direction he again assumed in 1895. In 1879 he was ordained a priest of the Protestant Episcopal Church and appointed rector of St. James's parish, Cambridge. His publications include *The Conversations of Jesus* (1875), and *Phillips Brooks* (1900).

ABBOTT, Rev. Edwin Abbott (1838—). An English author, born in London. He graduated at St. John's College, Cambridge, with distinction (B.A. 1861, M.A. 1864); was assistant master in King Edward's School, Birmingham (1862-64), and head-master of the City of London School (1865-1889), which he made one of the best day schools in England; retired in 1889, and received a pension the next year. He was twice Select Preacher at Cambridge and once at Oxford. He published *Cardinal Newman* (1892), *St. Thomas of Canterbury* (1898), *Shakespearian Grammar* (1869; third edition revised and enlarged, 1870), a pioneer work which, though unscientific, has hardly been superseded; *Clue, a Guide through Greek to Hebrew Scripture* (1900); *Corrections of Mark Adopted by Matthew and Luke* (1901), *and Comparison of the Words of the Fourth Gospel with those of the Three* (1905).

ABBOTT, Emma (Emma Abbott Wetherell) (1849-1891). An American soprano, born in Chicago, Ill. She began her musical experience in the choir of Plymouth Church, Brooklyn, N. Y., and afterwards studied in Milan under San Giovanni and in Paris under Wartel and Albert James. She made her début at Covent Garden, London, as Maria in *La Fille du Régiment*. For three years thereafter she made an operatic and concert tour of England and Ireland under the direction of Colonel Mapleson. Subsequently she returned to the United States, where she sang with the Abbott and Hess Opera Company, and later with the English opera company long known by her name. She sang in *Martha*, *Faust*, *Les Huguenots*, *The Chimes of Normandy*, and the more popular works of Verdi, Bellini, and Donizetti. With the exception of Clara Louise Kellogg, she was perhaps more widely known than any other American singer of her time.

ABBOTT, Frank Frost (1860—). An American Latinist, born at Redding, Conn. He graduated at Yale in 1882, and in 1891 received the degree of Ph.D. From 1885 to 1891 he was tutor at Yale; and in 1891 was appointed professor of Latin in the University of Chicago. He was also professor in the American School of Classical Studies at Rome, from 1901 to 1902. He wrote *A History of Roman Political Institutions* (1901), *The Toledo Manuscript of the Germania of Tacitus* (1903), etc.

ABBOTT, Gorham Dummer (1807-1874). An American Congregational clergyman and educator, born in Hallowell, Me. He graduated at Bowdoin in 1826 and at Andover in 1831. With his brothers, Jacob and John S. C. Abbott, he was a pioneer in the higher or collegiate education of young women. In 1847 he founded the Spingler Institute, in New York City. The school maintained a high reputation during its brief history. He wrote *The Family at Home, Nathan W. Dickerman, Pleasure and Profit.*

ABBOTT, Jacob (1803-79). A popular juvenile and didactic writer. He was born at Hallowell, Me. He graduated at Bowdoin College in 1820. Like his brother John, he studied for the ministry at Andover, and was ordained to the Congregational ministry. From 1825 to 1829 he was professor of mathematics and natural philosophy at Amherst. He then established a girls' school in Boston, and in 1834 organized the Eliot Church, Roxbury. Five years later he moved to Farmington. He passed the remainder of his life there, in New York, and in foreign travel, devoting himself wholly to literature. He died at Farmington, October 31, 1879. Abbott published more than two hundred volumes, the most noteworthy of which are *The Rollo Books* (28 volumes), *The Franconia Stories* (10 volumes), *The Rainbow and Lucky Series* (5 volumes), a number of juvenile histories, written in collaboration with his brother, and a series of histories of America. He also edited many school books. His style had a singular fascination for the young, and many of his writings continue to be popular.

ABBOTT, Sir John Joseph Caldwell (1821-93). A Canadian statesman, born at St. Andrew's, Quebec. He was educated at McGill College, Montreal; studied law, and in 1847 was called to the bar. Beginning in 1859 he represented Argenteuil County in the Canadian Assembly until the union in 1867, when he became a member of the Dominion Parliament for the same place. In 1862 he was solicitor-general in the cabinet of John Sandfield Macdonald, but resigned before his chief lost power. In 1887 Sir John A. Macdonald invited him to join the cabinet as a minister without portfolio. In June, 1891, on the death of Sir John A. Macdonald, Abbott was made Premier of the Dominion Government, but resigned in November, 1892, because of his ill health. He took a seat in the cabinet of his successor, Sir John Thomson, but without a portfolio. He was Dean of the Faculty of Law of McGill University for ten years, was considered an authority on commercial law, and was knighted in 1892.

ABBOTT, John Stevens Cabot (1805-77). An American historian, pastor, and pedagogical writer, a brother of the equally prolific Jacob Abbott (q.v.). He was born at Brunswick, Me., and graduated at Bowdoin College in 1825. He studied for the ministry at Andover, and was ordained a Congregational minister in 1830. He held successive pastorates at Worcester, Roxbury, and Nantucket. His writings were, from the outset, popular. Beginning with semi-religious pedagogy, *The Mother at Home* (1833), *The Child at Home*, etc., he was presently diverted to history, and after 1844 resigned his pastorate, giving himself entirely to literature. He died at Fairhaven, Conn., June 17, 1877. His most noteworthy books are *The French Revolution, The History of Napoleon Bonaparte, Napoleon at St. Helena, The History of Napoleon the Third* (1868), *The History of the Civil War in America* (1863-65), and *The History of Frederick II., Called Frederick the Great* (New York). All these are readable, but none of them has any critical value.

ABBOTT, Lyman, D.D. (1835—). An American Congregational clergyman and editor. He was born at Roxbury, Mass., a son of Jacob Abbott. He graduated at the New York University in 1853 and for a time practiced law with his brothers Austin and Benjamin Vaughan Abbott. Afterward he studied theology with his uncle, Rev. John S. C. Abbott, and became pastor of a church at Terre Haute, Ind., in 1860. Five years later he was made secretary of the American Union (Freedman's) Commission and became pastor of the New England Church in New York City. In 1869 he resigned this pastorate and thereafter was successively one of the editors of *Harper's Magazine*, the principal editor of the *Illustrated Christian Weekly*, and, as associate of Henry Ward Beecher, an editor of the *Christian Union* (now the *Outlook*), of which he afterward became editor-in-chief. He succeeded Mr. Beecher as pastor of Plymouth Church, Brooklyn, in 1888, but resigned in May, 1899, and has since devoted himself entirely to editorial and literary work. In collaboration with his brothers Austin and Benjamin he wrote two novels, *Conecut Corners* (1885) and *Matthew Caraby* (1888). Among his other numerous works are commentaries, *Jesus of Nazareth* (1869); *Life of Henry Ward Beecher* (1883); *Christianity and Social Problems* (1896); *The Theology of an Evolutionist* (1897); *Life and Letters of Paul* (1898); *Life and Literature of the Ancient Hebrews* (1901); *The Rights of Man* (1901); *Henry Ward Beecher* (1903); *The Great Companion* (1904); *Personality of God* (1905); and *Industrial Problems* (1905).

ABBOTT, Thomas Kingsmill (1829—). An Irish scholar. He was born at Dublin and was educated at Trinity College, where he afterward occupied the chair of moral philosophy (1867-72), of biblical Greek (1875-88), and of Hebrew (after 1879). He wrote the following books: *The Elements of Logic* (third edition, 1895); *Essays*, chiefly on the original texts of the Old and New Testaments (1892); *A Commentary on Ephesians and Colossians* (1897); a translation of *Kant's Ethics*, with a memoir, and Kant's *Introduction to Logic* (fifth edition, 1878).

ABBRE'VIA'TIONS (Lat. *ad*, to + *brevis*, short). Contrivances in writing for saving time and space. They are of two kinds, consisting either in the omission of some letters, or words, or in the substitution of some arbitrary sign. In the earliest times, when uncial or lapidary characters were used, abbreviations by omission prevailed, such as we find in the inscriptions on monuments, coins, etc. In these the initial letter is often put instead of the whole word, as M. for Marcus, F. for Filius. It was after the small Greek and Roman letters had been invented by transcribers for facilitating their work that signs of abbreviation, or characters representing double consonants, syllables, and whole words, came into use. Greek manuscripts abound with such signs, and often only one who has expressly studied Greek paleography can make them out. From the manuscripts they passed into the early printed editions of Greek books, and it is only within the last century that they have quite disappeared. Among the Romans the system was carried to such an extent that L. Annæus Seneca collected and classified 5000 abbreviations. The same practice has prevailed in all languages, but nowhere more than in the rabbinical writings. The abbreviations used by the ancient Romans were continued and increased in the Middle Ages. They occur in inscriptions, manuscripts, and legal documents; and the practice endured in these long after the invention of printing had made it unnecessary in books. An act of Parliament was passed in the reign of George II., forbidding the use of abbreviations in legal documents. Owing to these abbreviations, the deciphering of old writings requires special study and training, and forms a separate science, on which numerous treatises have been written. One of the most exhaustive is Tassin's *Nouveau Traité de Diplomatique* (6 volumes, Paris, 1750-65). See Paleography.

In ordinary writing and printing few abbreviations are now employed. The sign *&*, originally an abbreviation for the Latin *et*, "and," is one of the few still to be met with of this arbitrary kind. It does not stand properly for a *word*, for it is used in different languages, but for an idea, and is as much a symbol as +. The abbreviations by using the initials of Latin words that are still in use are chiefly confined to titles, dates, and a few phrases; as M.A. (*magister artium*), Master of Arts; A.D. (*anno Domini*), in the year of our Lord; *e.g.* (*exempli gratia*), for example. Many are now formed from English words in the same way; as F.G.S., Fellow of the Geological Society; B.C., before Christ.

The following table contains many of the more important abbreviations in general use. There are omitted from it many others whose meanings are obvious, and all abbreviations for days, months, countries, States, many proper names, as those of the Scriptures; grammatical, scientific, and other technical terms; familiar titles, as *Mr.*, *Gov.*; and the majority of commercial terms, as B/l, bill of lading. The names of many societies are omitted, especially when their abbreviations, as *Y.M.C.A.*, are well known.

A.B., Bachelor of Arts.

Abp., Archbishop.

A.C. (*ante Christum*), Before Christ.

Accel. (*accelerando*), In music, more quickly.

A.D. (*anno Domini*), In the year of our Lord.

A.D.C., Aide-de-camp.

A.H. (*anno Hegiræ*), In the year of the Hegira (reckoning from 622 A.D.).

Ad. Lib. (*ad libitum*), At pleasure.

Aet. (*ætatis*), Of (his or her) age.

A.M. (*ante meridiem*), Before noon; (*anno mundi*), In the year of the world; (*artium magister*), Master of Arts.

An. (*anno*), In the year.

Anon., Anonymous.

A.R.A., Associate of the Royal Academy (London).

A.S.A., American Statistical Association.

A.T.S., American Tract Society.

A.U.C. (*ab urbe condita*), From the building of the city—that is, Rome.

A.V., Authorized Version.

b., Born.

B.A. or A.B. (*artium baccalaureus*), Bachelor of Arts.

Bart. or Bt., Baronet.

B.C., Before Christ.

B.C.L., Bachelor of Civil Law.

B.D., Bachelor of Divinity.

B.L., Bachelor of Letters.

B.LL., Bachelor of Laws.

B.M., Bachelor of Medicine.

B.Mus., Bachelor of Music.

Bp., Bishop.

B.S. or B.Sc., Bachelor of Science.

B.V.M., Blessed Virgin Mary.

C. (*centum*), a hundred; chapter; c. (*circa*), about; c. century. Also C.=Centigrade.

Cantab. (*Cantabrigiensis*), Of Cambridge.

C.B., Companion of the Bath.

C.E., Civil Engineer.

cf. or cp., Confer; compare.

C.I., Order of the Crown of India.

C.I.E., Companion of the Order of the Indian Empire.

C.M.G., Companion of St. Michael and St. George.

Co., County.

c/o, Care of.

C.O.D., Cash, or collect, on delivery.

Cr., Creditor.

Cresc. (*crescendo*), In music, more loudly.

C.S.I., Companion of the Star of India.

cwt., Hundred-weight.

d. (*denarius*), Penny; died.

D.C. (*da capo*), From the beginning.

D.C.L., Doctor of Civil Law.

D.D., Doctor of Divinity; *donum dedit.*

D.D.S., Doctor of Dental Surgery.

D.G. (*Dei gratia*), By the grace of God; (*Deo gratias*) thanks be to God.

Dim. (*diminuendo*), In music, less loudly.

D.Lit., Doctor of Literature.

Do. (Ital. *detto*, said), Ditto, the same.

D.O.M. (*Deo optimo maximo*), To God the best and greatest.

Dr., Doctor, debtor.

D.Sc., Doctor of Science.

D.S.O., Companion of the Distinguished Service Order.

D.V. (*Deo volente*), God willing.

dwt., Pennyweight.

e.g. or ex. gr. (*exempli gratia*), For example.

et. al. (*et alii*), And others.

etc. (*et cetera*), And the rest; and so on.

et seq. (*et sequentia*), And the following.

F., Fahrenheit.

f. (*forte*), loudly.

F. and A. M., Free and Accepted Masons.

F.D. (*fidei defensor*), Defender of the Faith.

ff. (*fortissimo*), Very loud.

f. or ff., Following.

fl. (*floruit*), Flourished.

F.M., Field Marshal.

F.R.C.P., Fellow of the Royal College of Physicians.

F.R.C.S., Fellow of the Royal College of Surgeons.

F.R.G.S., Fellow of the Royal Geographical Society.

F.R.S., Fellow of the Royal Society.

F.S.A., Fellow of the Society of Antiquaries.

G.C.B. (Knight), Grand Cross of the Bath.

G.C.M.G. (Knight), Grand Cross of St. Michael and St. George.

G.C.S.I. (Knight), Grand Commander of the Star of India.

H.B.M., His (or Her) Britannic Majesty.

H.E., His Eminence; His Excellency.

H.I.H., His (or Her) Imperial Highness.

H.M.S., His (or Her) Majesty's Service, or Ship.

H.S.H., His (or Her) Serene Highness.

I. (*imperator* or *imperatrix*), Emperor or Empress.

ib. or ibid. (*ibidem*), In the same place.

Id. (*idem*), The same; (*idus*), the Ides.

i.e. (*id est*), That is.

I.H.S.* (*Iesus Hominum Salvator*), Jesus the Saviour of men.

Incog. (Ital. *incognito*), Unknown.

Inf. (*infra*), Below.

In loc. (*in loco*), In the place referred to.

I.N.R.I. (*Iesus Nazarenus Rex Judaœrum*), Jesus of Nazareth, the King of the Jews.

Inst. (*instante—mense* understood), In the current (month).

I.O.O.F., Independent Order of Odd Fellows.

J.C.D. (*juris civilis doctor*), Doctor of Civil Law.

J.P., Justice of the Peace.

Jr., Junior.

J.U.D. (*juris utriusque doctor*), Doctor of Laws, i.e., both of civil and canon law.

Kal. (*Kalendæ*), The Kalends.

K.C., King's Counsel.

K.C.B., Knight Commander of the Bath.

K.C.M.G., Knight Commander of St. Michael and St. George.

K.C.S.I., Knight Commander of the Star of India.

K.P., Knight of St. Patrick.

K.T., Knight of the Thistle.

L. (*libra*), Pound (in English money).

℔. (*libra*), Pound (weight).

l.c. (*loco citato*), In the place cited; (lower case) small letters in printing.

leg. (*legato*), smoothly.

L.H.D. } (*litterarum humaniorum doctor*),
Litt.D. } Doctor of Literature, or Letters.

LL.B. (*legum baccalaureus*), Bachelor of Laws (the double L denoting the plural).

LL.D. (*legum doctor*), Doctor of Laws.

L.S. (*locus sigilli*), The place of the seal.

M., Monsieur; MM., Messieurs (plural); (*meridies*) noon.

M.A., Master of Arts.

M.B., Bachelor of Medicine.

M.C., Member of Congress.

M.D. (*medicinæ doctor*), Doctor of Medicine.

M.E., Mining or Mechanical Engineer; Methodist Episcopal.

mf. (*mezzo forte*), Moderately loud.

M.F.H., Master of Fox Hounds.

Mlle., Mademoiselle.

Mme., Madame.

M.P., Member of Parliament; Methodist Protestant.

M.S. or M.Sc., Master of Science.

MS., Manuscript; MSS., manuscripts.

Mus.D. (*musicæ doctor*), Doctor of Music.

N.B. (*nota bene*), Mark well.

nem. con. (*nemine contradicente*), Unanimously.

n.d., No date.

Non. (*nonæ*), The Nones.

N.S., New style.

Ob. (*obiit*), Died.

O.P. (*ordinis prædicatorum*), Of the Dominican Order.

O.S., Old style.

O.S.A., Order of St. Augustine.

O.S.F., Order of St. Francis.

Oxon. (*Oxoniensis*), Of Oxford.

p. (*piano*), Softly.

P.C., Privy Councilor.

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*This was originally written IHΣ, the first three Greek letters of the name Jesus; but its orgin having been lost sight of, by substituting S for Σ and then mistaking the Greek H (long e) for Latin H, a signification was found for each letter. The symbol was further developed by converting the horizontal stroke, which was the sign of abbreviation, into a cross, in which form it is the recognized device of the Jesuit order.

Ph.B. (*philosophiæ baccalaureus*), Bachelor of Philosophy.

Ph.D. (*philosophiæ doctor*), Doctor of Philosophy.

P.E., Protestant Episcopal.

Ph.G., Graduate Pharmacist.

P.L., Poet Laureate.

P.M. (*post meridiem*), After noon; postmaster.

pp. (*pianissimo*), Very softly.

P.P., Parish priest.

P.P.C. (Fr. *pour prendre congé*), To take leave.

p., Page; pp., pages.

pro tem. (*pro tempore*), For the time.

prox. (*proximo—mense* understood), In the next (month).

P.S. (*post scriptum*), Postscript.

P.T.O., Please turn over.

Q., Query or question.

Q.C., Queen's Counsel.

Q.E.D. (*quod erat demonstrandum*), Which was to be proved.

Q.E.F. (*quod erat faciendum*), Which was to be done.

Q.S. (*quantum sufficit*), A sufficient quantity.

q.v. (*quod vide*), Which see.

R. (*rex* or *regina*), King or queen. Also, R. = Réaumur.

R. or ℞ (*recipe*), Take.

R.A., Royal Academician; Royal Artillery; Royal Arch.

rall. (*rallentando*), More slowly.

R.A.M., Royal Academy of Music.

R.C., Roman Catholic.

R.E., Royal Engineers.

R.I.P. (*requiescat in pace*), May he rest in peace.

rit. (*ritardando*), More slowly.

R.M., Royal Marines.

R.N., Royal Navy.

R.S.V.P. (Fr. *répondez s'il vous plaît*), Please reply.

R.V., Revised version.

S., Saint; south; shilling; SS., saints.

sc. (*scilicet*), Namely; understood.

sf. (*sforzando*), With marked emphasis.

S.J., Society of Jesus.

s.p. (*sine prole*), Without issue.

S.P.Q.R. (*senatus populusque Romanus*), The Senate and People of Rome.

sq. (*sequens*), The following; sqq. in the plural.

Sr., Senior.

S.S., Steamship; Sunday school.

St., Saint; street.

S.T.D. (*sanctæ theologiæ doctor*), Doctor of Divinity.

S.T.P. (*sanctæ theologiæ professor*), Doctor of Divinity.

sup. (*supra*), above.

s.v. (*sub voce*), Under the heading.

T.C.D., Trinity College, Dublin.

Twp., Township.

ult. (*ultimo—mense* understood), In the last (month).

U.P., United Presbyterian.

U.S., United States.

U.S.A., United States of America; United States Army.

U.S.N., United States Navy.

V.C., Victoria Cross; Vice Chancellor.

vs. (*versus*), Against.

Consult, for a reproduction of 13,000 abbreviations used in old Latin MSS., Campelli, *Dizionario di Abbreviature* (Milan, 1899).

ABBRE′VIA′TIO PLAC′ITO′RUM (Lat., abridgment or abstract of pleas). A record of judicial decisions in the itinerant Court of the King's Bench (*curia regis*, q.v.) in the Norman period of English law. It is one of the earliest collections of judicial precedents in our law, antedating the *Year Books* (q.v.). It was first published in 1811. See articles on NORMAN LAW; PLEA; PLEADING; MASTER OF THE ROLLS; and REPORT.

ABBRE′VIA′TORS. In the Papal Court, a college of eleven prelates to whom the revision of the papal bulls and other similar documents is committed, and who sign them in the name of the Cardinal Vice Chancellor. They date from Pius II. (1458-64), and derive their name from the fact that by means of traditional abbreviations they prepared a short minute of the decision, which they subsequently expanded into proper form.

ABBT, äpt, THOMAS (1738-66). A German author, born at Ulm, educated at the University of Halle, and professor of mathematics at Rinteln. He did much toward the improvement of the language of his country. Of his books the more important are *Vom Verdienste* (1765), and *Vom Tod für's Vaterland* (1761).

ABCHERON, äb′she-rōn′, or **ABSHERON.** See APSHERON.

ABD, ăbd. In Arabic and in the Semitic languages in general, "slave" or "servant," as in Abd-Allah, "servant of Allah"; Abd-al-Kader, "servant of the mighty one," etc.

ABD ALLAH IBN ZUBAIR, ăbd ä′lȧ ′b′u so͞o′bär′ (622-692). Ruler of Mecca. He was the son of Zubair and nephew, by alliance, of the Prophet. Believing himself more entitled to the caliphate than Yazid, the son of the usurper, Abd Allah began to struggle for supremacy after Ali's assassination. He seized Mecca, holding it against Yazid, Caliph of Damascus. During the siege the Kaaba was destroyed, but Yazid's death saved the city from capture. Abd Allah was acknowledged Caliph of Mecca, and rebuilt and restored the city by 685. The caliphs of Damascus renewed the war, and Mecca was again besieged, and after a stubborn resistance was finally taken by assault, and Abd Allah, who retreated within the Kaaba, was slain.

ABD ALLAH IBN TASHFUR, täsh′fo͞or (died 1058). The founder of the Almoravide sect in Morocco, which in a short space of time, through the propaganda of the sword, became transformed into a temporal power, overran northern Africa and conquered Mohammedan Spain. Though holding supreme authority for a long time, he was content with no other title than that of "Theologian."

ABD-AL-LATIF, ăbd′ ȧl lȧ-tēf′. See ABD-UL-LATIF.

ABD AL MUMIN ABU MOHAMMED, ăbd ăl mo͞o′mên ä′boo mȯ-hăm′mĕd (c.1094-1163). The founder of the dynasty of the Almohades (q.v.). He was born at Tajira, in the Province of Tlemcen, North Africa, and was a member of the Kumiya, one of the Berber tribes of the Atlas region. After the death of Ibn Tumart, the founder of the sect of the Almohades, who had shown great favor to Abd al Mumin, he was chosen as his successor. He now assumed the title of Caliph, put the Almoravides to flight, and conquered the cities of Oran, Tlemcen, Fez, Salé, Ceuta, and finally, after a siege of eleven months, Morocco (1140-47). He extended his dominion over Al-Maghrib and the other provinces of North Africa, and passed over into Spain, conquered Cordova (1148), Almeria (1151), and Granada (1154); in short, the greater part of Mohammedan Spain.

ABD-EL-AZIZ, Mulai (1878—). Sultan of Morocco. He was born at Marakesh, and succeeded his father, Sultan Mulai Hassan, in 1894. He was friendly towards Europeans, taking great interest in all kinds of Western inventions. His foreign sympathies offended his subjects, and in 1902 a formidable rebellion broke out under the leaderhip of a prophet, Bu Hamara. The resulting disorders gave France an opportunity to establish its predominance in the country and led to the Algeciras Conference in 1906. See Morocco.

ABD-EL-KADER IBN MOUHI AD-DIN, ăbd′el-kä′dẽr 'b'n mōō′hē ȧd-dēn′ (c. 1807-83). An Algerian ruler and patriot. He was born near Mascara, and was educated under the supervision of his father at the Ghetna, an educational institution of the Marabouts. In his eighth year Abd-el-Kader made a pilgrimage to Mecca with his father; and in 1827 he visited Egypt, where, in Cairo and Alexandria, he first came in contact with Western civilization. He had a gifted mind, and a character marked by religious enthusiasm and a tendency to melancholy. He was free from cruelty and sensuality. He studied in the chief schools of Fez, maintained the faith of his people, and used their fanaticism as one of his most important sources of influence. His public career began at the time of the conquest of Algiers by the French. No sooner was the power of the Turks broken, than the Arab tribes of the province of Oran seized the opportunity to make themselves independent. They obtained possession of Mascara and elected Abd-el-Kader their emir. He established his authority over a number of the neighboring tribes. He attacked the French, and after two bloody battles, fought on December 3, 1833, and January 6, 1834, against General Desmichels, then commanding in Oran, obliged the latter to enter into a treaty with him. In the interior of the country his power spread rapidly. The cities and tribes of the provinces of Oran and Titeri acknowledged him as their sultan; the more distant tribes sent him ambassadors with presents. Hostilities were soon resumed between him and the French. General Trézel, at the head of a French army, was attacked at Makta, on June 28, 1835, by nearly 20,000 Arab cavalry, and suffered a defeat. The tide turned, however, and after a struggle of six years Abd-el-Kader found himself obliged (1841) to take refuge in Morocco. There he succeeded in organizing a religious war against the enemies of Islam, and the arms of France were now turned against Morocco for the support given to him. After the decisive battle of Isly (1844) the Sultan of Morocco was obliged to give up Abd-el-Kader's cause, but soon found that the latter was at least his equal in power. The end of Abd-el-Kader's power, however, had come. On the night of December 11, 1847, he made a bold attack on the Moorish camp, in which he was defeated. He fled with his followers to Algeria, where the greater part surrendered to the French. Dispirited, Abd-el-Kader surrendered December 22, 1847, to General Lamoricière and the Duc d'Aumale. He was kept a prisoner with his family at Toulon, Pau, and the Château d'Amboise. Liberated in 1852 by Napoleon III., he lived at Brussa, in Asia Minor, till 1855. He then, for a time, lived in Constantinople, and finally made his home in Damascus. For his services during the Syrian massacres of 1860 he received the Grand Cross of the Legion of Honor from Napoleon III. In 1865 he visited Paris and England, and was present at the Paris Exposition in 1867. In his retirement he wrote a religious work, a translation of which was published at Paris in 1858, under the title, *Rappel à l'intelligent: avis à l'indifférent.* He died in Damascus, May 26, 1883. See Algeria; consult C. H. Churchill, *The Life of Abd-el-Kader* (London, 1867, described as "written from his own dictation and compiled from other authentic sources," highly eulogistic, and in no sense a scientific biography: Laménaire, *Vie, aventures, combats, amours et prise d'Abd-el-Kader* (Paris, 1848); Bellemare, *Abd-el-Kader, sa vie politique et militaire* (Paris, 1863) and the 'Life' by Pichon (1899).

ABD-EL-MELEK, ăbd′el-mȧ′lĕk. See Asmai.

ABD-EL-WAHHAB, ăbd′el-wäh′häb. See Wahabis.

AB′DEMON. A Tyrian who distinguished himself by solving the riddles which had been propounded to his master, Hiram, by King Solomon. According to the story, Solomon challenged Hiram and the Tyrians to a contest of wits, each side sending riddles for solution by the other. Solomon had already won in the competition and the amount agreed upon as a wager had been paid him, when Abdemon entered the lists, and not only found answers to the riddles which had baffled his countrymen, but also invented others. Solomon failed to answer them and returned the forfeit.

ABDE′RA (Gk. Ἄβδηρα). A town on the coast of Thrace between the mouth of the Nestus and Lake Bistonis. It is fabled to have been founded by Hercules on the spot where his favorite, Abderus, was torn to pieces by the steeds of Diomedes. It was colonized 656 B.C. under the leadership of Timesius of Clazomenæ, but soon after was destroyed by the Thracians, and in 543 B.C. was recolonized by the inhabitants of Teos. It was the birthplace of Protagoras, Democritus, Anaxarchus, the later Hecatæus, and other distinguished men. The natives were, however, proverbial for stupidity, and 'Abderite' was a term of reproach.

ABD-ER-RAHMAN or **ABDERRAHMAN.** The name of several Arab rulers of Spain. See Ommiads.

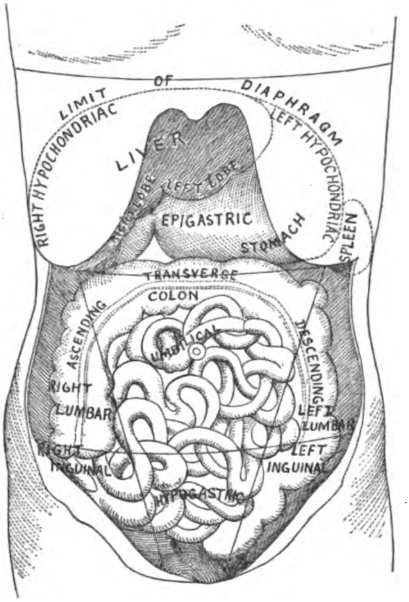
ABD-ER-RAHMAN, IBN ABDALLAH, ăbd′er-räh′mȧn 'b'n ȧb-däl′lȧ (?-732). A Saracen governor of Spain. At the head of about 80,000 men he invaded Gaul in 732, but encountered the Franks under Charles Martel and Eudes, near Poitiers (October, 732). After six days of hand-to-hand fighting, during which Abd-er-Rahman was slain, the Christians gained a decisive victory, and put an effectual check to the conquests of the Arabs of Spain.

AB′DICA′TION (Lat. *abdicatio*, renunciation, from *ab*, away from + *dicare*, to proclaim). The renunciation of an office, generally the office of ruler or sovereign. It is rarely done out of pure preference of a private station, but is generally the result of vexation and disappointment. The general well-being of a State is sometimes served by the abdication of its ruler. Military reverses, popular disaffections, court scandals and other causes often render it imperative. History records many abdications of this character. It was perhaps voluntarily and from being wearied with dominion, that Diocletian, and along with him Maximian, abdicated (305). Christina of Sweden retired from the throne (1654) out of preference for the freedom of private life, but wished still to exercise the rights of a sovereign. Charles V. of Germany laid down the crown (1556) and assumed the humble habit of a monk, because his great schemes had failed. Philip V. of Spain laid down the crown in 1724, but resumed it on the death of his son. Amadeus VIII. of Savoy abdicated (1449) to become a priest. Victor Amadeus II. of Sardinia, who abdicated in 1730, wished to recall the step, but this was not allowed. Louis Bonaparte resigned the crown of Holland in 1810 rather than consent to treat that country as a province of France. Charles Emmanuel II. of Sardinia retired from the throne in 1802, not finding himself able to cope with the French. Victor Emmanuel I. of Sardinia resigned in 1821 in consequence of a revolutionary movement. William I. of the Netherlands resigned (1840) in great measure by reason of his mortification at the disastrous results of his policy regarding Belgium. Foreign force compelled the abdication of Augustus the Strong of Poland (1706), and later, that of Stanislaus Leszczynski (1735) and of Poniatowski (1795); as well as that of Charles IV. of Spain (1808), and of Napoleon (1814 and 1815). Insurrections have been the most frequent cause of forced abdications. The early history of the Scandinavian kingdoms abounds in instances. In England, the compulsory abdication of Richard II. (1399) is an early example. More recent times saw Charles X. of France (1830) and Louis Philippe (1848) retire before the storm of revolution. The abdication of Ferdinand of Austria (1848) was a consequence of the events of the year of revolutions; that of Charles Albert of Sardinia (1849) of the battle of Novara. Of several cases among German princes, the chief is that of Ludwig of Bavaria (1848). Amadeus, King of Spain, felt himself obliged to give up his crown on February 11, 1873. Prince Alexander of Bulgaria was compelled in 1886 to relinquish his principality, and three years later King Milan I. of Servia, worried by domestic troubles and beset by internal dissensions in his kingdom, left the throne to his son Alexander I. In some countries, the king can abdicate whenever he pleases; but in England, the constitutional relation between the crown and the nation being of the nature of a contract, the king or queen, it is considered, cannot abdicate without the consent of Parliament. It is, however, said that the king does abdicate, or, to speak perhaps more correctly, an abdication may be presumed, and acted on by the people, if his conduct politically and overtly is inconsistent with, and subversive of, the system of constitutional government of which the qualified monarchy of his office forms part. At the conference between the two Houses of Parliament previous to the passing of the statute which settled the crown on William III., it would appear that the word "abdicated" with reference to King James II. was advisedly used instead of "deserted"—the meaning, it is presumed, being that King James had not only deserted his office, but that by his acts and deeds, of which the said desertion formed part, he had, in view of the Constitution, ceased to have right to the throne. From this it may be inferred that abdication was considered to have a twofold political signification, involving maladministration as well as desertion. The Scottish convention, however, more vigorously and distinctly resolved that King James "had forefaulted [forfeited] the crown, and the throne was become vacant."

ABDI-CHIBA, ăb′dê-chē′bȧ. A governor of Jerusalem in the time of Amenophis IV. (1403-1385 B.C.). If correctly read, his name probably designates him as a "servant of Hadad," the storm-god; but it possibly was pronounced "Ardu-hipa," and may have been of Mitanian origin (compare Pu-hipa, Tadu-hipa, Gilu-hipa). Among the letters found at El Amarna, the site of Amenophis's capital, Chut-t-Aten, in 1888, Abdi-chiba was the author of at least six (179-184, edition Winckler) and possibly of two more (185, 186). He is also mentioned in a letter of Shuwardata (165). These letters are written in cuneiform characters and in a Babylonian language that was no doubt spoken by a part of the population in Syria. Abdi-chiba apparently came from a family that had reigned over Jerusalem before the Egyptian conquest, as he repeatedly reminded Amenophis of the fact that his father and mother had not made him a ruler, but the strong arm of the great king, probably Amenophis III., had given him the territory of his ancestors, who may have been Mitanians or Hittites. As king he seems to have had a certain control over the governors of Palestine. With his neighbors, Shuwardata at Kilti-Keilah and Milkili at Gath, he was often at war. He was accused by them of having plotted with the Khabiri and taken possession of Kilti, while he charged them with the capture of Bit Ninib, a town belonging to the country of Urusalim, and with betraying the land into the hands of the Khabiri. These were, perhaps, the Hebrews in the widest sense, including Israelitish, Edomitish, Moabitish, and Ammonitish clans. The term Abiru probably means simply a "nomad," a "wanderer." Neither the Egyptian resident, nor the king himself, seems to have trusted Abdi-chiba, and the correspondence leaves it doubtful whether the relief he asked for was finally granted. These Amarna letters have been published by Winckler, in *Der Thontafelfund von El Amarna* (Berlin, 1889-90), and *Keilinschriftliche Bibliothek*, Volume V. (1896). They have also been translated or discussed by Halévy in *Journal Asiatique* (Paris, 1891), and in *Revue Sémitique* (Paris, 1893), by Zimmern in *Zeitschrift für Assyriologie* (Leipzig, 1891, vi : 245-263), by Jastrow in *Journal of Biblical Literature* (Boston, 1892, 95-124), and *Hebraica*, ix : 24-46 (Chicago), by Delattre in *Revue des questions historiques* (Paris, 1896), and by Eduard Meyer in *Ægyptiaca* (Berlin, 1897).

ABDIEL, ăb′dĭ-ĕl (Heb. *'abd*, servant + *'ēl*, god). In *Paradise Lost*, the faithful angel who opposed the revolt in heaven begun by Satan.

ABDO′MEN. The lower cavity of the human body. The trunk of the human body is divided by the diaphragm into two cavities—the upper being the thorax or chest, and the lower the abdomen or belly. Both the cavity and the viscera it contains are included in the term abdomen. It contains the liver, pancreas, spleen, and kidneys, as well as the stomach, small and large intestine. The lower bowel, the bladder, and internal organs of generation lie in the lowest part of the cavity, which is called the pelvis. The abdomen is lined by a serous membrane, the peritoneum, which is folded over the viscera, allowing them a certain freedom of motion, but keeping them in their proper relations to each other. The abdomen is divided by two imaginary horizontal lines into three principal zones—the upper or epigastric, the middle or umbilical, and the lower or hypogastric. These are again subdivided by two vertical lines—the side-divisions being called the hypochondriac, lumbar, and iliac regions respectively; the names epigastric and umbilical are then applied in a restricted sense to the middle divisions of the two upper zones, while the middle division of the lower is called the hypogastric region. The abdominal viscera are subject to many important acute and chronic affections, to which reference is made under their respective headings.



ABDOMEN.

Abdomen. In entomology, the last of the three parts into which the body of an insect is divided. It is composed of a number of rings or segments, frequently nine, more or less distinct from each other. It contains a portion of the intestines and the sexual organs. In the perfect insect, its segments bear no legs or wings; but the hind legs of larvæ or caterpillars, which afterward disappear, are attached to them. In many insects, its last segments bear appendages of various uses and forms, as pincers, stings, borers or ovipositors, etc. See Anatomy and authorities there referred to.

ABDUC′TION. The English common law treated the abduction or unlawful taking away of a wife, or of a child, or of a ward, as a tort or private wrong to the husband, the parent, and the guardian respectively, and gave to the injured party an action for damages. The term is generally used, however, to denote the criminal offense of forcibly taking away a woman for the purpose of marriage or of prostitution. As distinguished from kidnapping (q.v.) the crime has been defined by statute in England for more than five hundred years. It is also a matter of statutory definition and regulation in this country. The tendency of our legislation is to extend the scope of the term far beyond its common law limits. For example, many statutes declare that a person receiving or harboring a female under the age of sixteen years for the purpose of prostitution is guilty of abduction. Nor is his ignorance of the girl's age any defense to the abduction. Under early English statutes, abduction, as therein defined, was a felony without benefit of clergy (q.v.). In this country it is a crime, punishable by imprisonment for a term of years or by a heavy fine or by both. (See Kidnapping.) Consult the authorities under Criminal Law. See also Wharton, *Criminal Law* (Philadelphia, 1896); Bishop, *New Criminal Law* (Boston, 1900); Clark and Marshall, *Treatise on the Law of Crimes* (St. Paul, 1905).

ABD-UL-AZIZ, äbd′ụl-ȧ-zēz′ (1830-76). Thirty-second sultan of the Ottoman Empire. He was the second son of Mahmud II., and succeeded his brother Abd-ul-Medjid, June 25, 1861. He placed the government in the hands of two ministers, Fuad and Ali, both of reforming tendencies, largely reduced his own civil list, and aroused hopes of an improvement in the condition of his empire. But he soon lapsed into reckless extravagance, and the projected reforms proved meaningless and ineffective. In 1867 he made a tour of Europe, visiting the Paris Exposition and several capitals, in which he spent a vast amount of money to little purpose. In 1868 he reorganized the council of state, and promised more reforms in response to the demand of the Powers; but the revolt in Crete took his attention, war with Greece was probable, and the state of the treasury precluded efficient reform. The Greek difficulty was arranged by a conference at Paris. Ismaîl Pasha, Khedive of Egypt, took advantage of the Sultan's financial embarrassment to obtain important concessions, among them a new law of succession for his house, and nearly all the prerogatives of an independent sovereign. The Sultan's affairs grew desperate. The friendship of France had been Turkey's main reliance during the Second Empire. When that fell in 1870, the rival Russian influence became powerful at Constantinople. When the revenues were so low as barely to pay interest on the public debt, a revolt began in Herzegovina (1875), and soon extended to Bosnia. A renewed and more imperative demand of the Powers for radical reforms was embodied in the "Andrássy note" (December 30, 1875), and the progressive constitutional party (Young Turkey) demanded the Sultan's abdication. He was deposed by the council of ministers May 30, 1876, and on June 4 was found dead in his apartments, whether by assassination or suicide is not known.

ABD-UL-HAMID (äbd′ụl-hȧ-mēd′) **I.** (1725-89). Sultan of Turkey and son of Ahmed III.

He succeeded his brother, Mustapha III., in 1774. He was twice involved in wars with Russia. By the treaty of Kutchuk-Kainardji in 1774, he was compelled to relinquish his suzerainty over the Crimea and other Tartar regions. In 1788 the town of Otchakov was stormed by the Russians, a humiliation that doubtless hastened his death. Consult: Assim Tarischi, *History of Abd-ul-Hamid and Selim III.* (Constantinople, 1867).

ABD-UL-HAMID II. (1842—). Thirty-fourth sultan of the Ottoman Empire; second son of Abd-ul-Medjid. He was born September 22, 1842, and succeeded to the throne August 31, 1876, on the deposition of his elder brother, Murad V. Abd-ul-Hamid came to power at a trying time. The insurrection in Bosnia and Herzegovina was gaining strength, Servia had declared open war upon Turkey, and Russia was fomenting the spirit of dissatisfaction in the Slav states tributary to Turkey. The party of Young Turkey, led by Midhat Pasha, attempted to establish a parliamentary government and to escape European control just when the aid of Europe was needed against Russia. The savage measures taken to suppress the revolt in Bulgaria and the failure of all Turkish promises of reform quickly alienated the Powers, who gave Russia a free hand. The Czar declared war in April, 1877, a Russian army at once invaded Turkey, and advanced almost to Constantinople. Turkey was saved only by European jealousy of Russia. The treaty of San Stefano between the belligerents was materially modified by the Congress of Berlin (q.v.), but even then Turkey lost its remaining claims to suzerainty over Montenegro, Servia, and Rumania, yielded all real sovereignty in Bulgaria, Bosnia, and Herzegovina, and lost some of its territory in Asia Minor. The Sultan was bound by the treaty to introduce reforms in the Christian provinces, but he failed to do this, and adopted a distinctly reactionary policy. He took into his own hands the direction of the council of ministers and made his government a personal one. The Armenian outrages from 1895 to 1896 at first aroused the signatory powers of the Berlin treaty to action, but the international relations at the time were complicated, and Abd-ul-Hamid pursued the policy he has always so well understood of eluding all demands for redress or reform by means of promises and excuses, playing off the rival Powers against one another in the meantime. In 1897 a rising in Crete, brought on by Turkish misgovernment, was assisted by Greece and led to war between that country and Turkey. (See GREECE.) Armenians inspired an attempt, on July 21, 1905, to assassinate the Sultan with a bomb, which killed about twenty of his followers. Conditions which threatened to revive the Eastern question in an acute form were, however, obscured by events in other parts of the world, and Turkish affairs remained quiet. Abd-ul-Hamid stands as the representative of the conservative orthodox Mohammedan party, and has revived the pretension to the actual headship of Islam. Consult: Bérard, *La Turquie et l'Hellénisme contemporain* (Paris, 1893), and *La politique du sultan* (Paris, 1897); E. Ollier, *Cassell's Illustrated History of the Russo-Turkish War* (London, 1900), voluminous, but not critical.

ABDULLÂH IBN ABDUL MUTTALIB, ăb-dụl'lȧ 'b'n ăb'dụl mōōt-tä'lĕb (545-570). The father of Mohammed. He was an only child, and was about to be sacrificed by his father when another person interfered and persuaded the father to sacrifice a hundred camels instead of the boy. Soon after Abdullah married Amîna, a daughter of Wahb, and of this union came the great Prophet. So beautiful was Abdullah that, according to tradition, on the day of his marriage two hundred maidens of Mecca died of broken hearts.

ABDULLAHI IBN SEYID MOHAMMED, ăb'dụl-lä'hē 'b'n sȧ-yēd' mȯ-hăm'mĕd (c. 1845-99). The "Khalifa," follower of the Mahdi (q.v.), whom he succeeded in 1885. He extended his dominions in the Sudan, but incurred the enmity of his followers by his cruelty. He was defeated by the British under Kitchener at Omdurman, September 2, 1898, and fled to the south with the remainder of his army, which was dispersed in the battle of Om Debrikat, November 24, 1899, Abdullahi himself being slain.

ABD-UL-LATIF, äbd'ụl-lȧ-tēf' (1160-1231). A prolific Arabian writer, physician, and traveler. He was born at Bagdad, and died while on the pilgrimage to Mecca. His early training consisted in memorizing not only the Koran, but also works on law, philology, and the standard poets. He then went to Damascus, whither Saladin had assembled the learned men of the Mohammedan world. Thanks to the liberality of Saladin and with letters of introduction from his vizier, Fadhl, Abd-ul-Latif was able to travel to Egypt, and in Cairo he sought out the great Jewish doctor and philosopher, Maimonides. At Cairo he taught medicine and philosophy (subjects with the Arabs generally combined), but his love of travel brought him to Damascus again and to Aleppo. Of the many works of Abd-ul-Latif only one, *The Account of Egypt,* is generally known. This was translated into Latin by White (1800) and into French by De Sacy (1810), *Relation de l'Egypte* (Paris, 1810). Consult Brockelmann, *Geschichte der arabischen Litteratur* (Weimar, 1898).

ABD-UL-MEDJID, äbd'ụl-me-jēd' (1823-61). Sultan of the Ottoman Empire from 1839 to 1861. He succeeded his father, Mahmud II., at a time when the Turkish Empire was threatened by the ambition of the great Viceroy of Egypt, Mehemet Ali. The army had been defeated and dispersed by the Egyptians in the battle of Nisib, June 24, 1839, and there was nothing to hinder the victorious Ibrahim Pasha from advancing on Constantinople, where a large party was favorable to the elevation of Mehemet Ali to the sultanate. The intervention of the Christian Powers saved the house of Osman. The treaty of July, 1840, from which France kept aloof, rescued the young Sultan from sure destruction. Mehemet Ali had to submit, November 27, 1840, to the restriction of his power to Egypt; and the treaty of July, 1841, to which France subsequently adhered, settled the future dependent relation of Egypt to Turkey. The Sultan, though not very energetic in body or mind, proceeded in the path of reform begun by Selim III. and Mahmud II. In this he had for his chief adviser Reshid Pasha, an intelligent and humane Mussulman, educated in France. The aim of all his measures was to place the Ottoman population on a footing with the civilized inhabitants of the West. A proclamation of the rights of all subjects, irrespective of creed, was issued in the *hatti-sherif* of November, 1839. This was followed by numerous reforms in all departments, and in 1850 the adherents of all religions were decreed equal in the eye of the law. The good purpose of these decrees was obstructed by the illiberal Moslems, and they remained practically a dead letter. In 1850, the Sultan, in spite of the menaces of Russia and Austria, refused to give up Kossuth and the other Hungarian refugees. The Sultan had a specially difficult part to play during the war with Russia (1853-56) and the diplomatic negotiations consequent to it. Abd-ul-Medjid was the thirty-first sovereign of the race of Osman. He died June 25, 1861, and was succeeded by his brother, Abd-ul-Aziz (q.v.). See Ottoman Empire.

ABD-UR-RAHMAN, äbd′ṳr-rä′mȧn (1778-1859). Sultan of Fez and Morocco from 1823 to 1859. He was the rightful heir to the throne when his father died in 1794, but was superseded by an uncle, after whose death he ascended the throne. The first four years of his reign were occupied in quelling insurrections. Austria refused to pay the tribute for safety against pirates; but the Sultan wisely adjusted the dispute by relinquishing this sort of blackmail, formerly levied on European ships in the Mediterranean. The war waged by Abd-el-Kader (q.v.) against the French in Algeria involved the Sultan in its events. He was overwhelmed by Bugeaud in the battle of Isly (1844), and forced to turn against Abd-el-Kader. The Sultan was a zealous Mussulman without the fanaticism common among his countrymen; as a ruler he was strict and often cruel. He was succeeded by his eldest son, Sidi-Mohammed (1803-1873).

ABD-UR-RAHMAN ('Abd al-Rahman) Khan, hän *or* kän (1830-1901). Ameer of Afghanistan from 1880 to 1901. In the confusion succeeding the death of his grandfather, Dost Mohammed (q.v.) (1863), he supported the pretensions of his father, Afzul, against his uncle, Shere Ali, who had been named as his successor by the late Ameer. The rebellion was at first successful, and Abd-ur-Rahman was installed as Governor of Balkh, where he showed himself a wise ruler. In 1868 Shere Ali overthrew his rivals and Abd-ur-Rahman took refuge in Russian territory, living at Samarcand upon a liberal Russian pension. In 1879 he returned to his old province of Balkh, which had always been well disposed toward him. Yakub, the son of Shere Ali, who had been set up as ameer by the English, and then left to shift for himself, was unable to maintain order, and a new war with the English was followed by his deposition. Abd-ur-Rahman, in July, 1880, was recognized as ameer by the leading chiefs and was confirmed by the Anglo-Indian Government, from whom he received a subsidy of £160,000 a year and much in the way of military equipment. It had been feared from his previous relations with Russia that he would be favorable to Russian designs; but he at once resumed the pro-English policy of his grandfather, and, by a firm and skillful control of the tribes of his realm, he preserved the integrity of Afghanistan and maintained peaceful relations with his powerful neighbors. In 1893 the mountainous district of Kafiristan, in the Hindu Kush, was ceded to him by the Anglo-Indian Government, and in 1896 he completed the subjugation of the tribes inhabiting it. He was an intelligent, well-meaning ruler, of a masterly habit, which stood him in good stead in dealing with his half-barbarous people. He was made by the British Government a Grand Commander of the Bath and also of the Star of India. He died October 3, 1901, after a brief illness, and was succeeded by his eldest son, Habib Ullah (q.v.), who for some time had borne an active part in the government and shown much administrative ability. See Afghanistan. Consult: J. A. Gray, *At the Court of the Ameer* (London, 1895); Wheeler, *The Ameer Abdurrahman* (London, 1895); Mohammed Khan (Mir Munshi Sultan), *The Life of Abdur Rahman, Ameer of Afghanistan* (London, 1900).

ABECEDARIANS, ā′bê-sê-dā′rĭ-*a*nz (Lat. *abecedarius*, pertaining to the alphabet, with reference to the first four letters). Followers in 1522 of Nikolaus Storch, a clothmaker of Wittenberg, a disciple of Luther, who imbibed enthusiastic views commonly called Anabaptist. They believed it was best not to know how to read, since the Holy Spirit would convey knowledge of the Scriptures directly to the understanding, and, as education might be a hindrance to salvation, they encouraged pupils to leave the schools and universities and learn trades.

A′BECE′DARY CIR′CLES. Rings of letters described around magnetized needles, by looking at which friends at a distance were supposed to be able to communicate with each other.

A′BECK′ET, Thomas. See Becket, Thomas.

A′BECKETT, Arthur William (1844—), son of Gilbert Abbott A'Beckett. An English journalist, novelist, and dramatist. He was born in London, and edited various comic periodicals and monthly magazines. In the Franco-Prussian War he was special correspondent for the London *Standard* and *Globe*. In 1874 he became a member of the staff of *Punch*. His publications include several novels and dramas, besides *London at the End of the Century* (1900) and *The A'Becketts of Punch* (1903).

A′BECKETT, Gilbert Abbott (1811-56). An English humorous writer, born in London. He became a lawyer, and during the last seven years of his life was a metropolitan police magistrate, in which office he displayed marked ability. He also devoted much of his time to literature; was the founder of *Figaro in London*, the precursor of *Punch*, and became one of the original staff of the latter. He wrote more than sixty plays, and with Mark Lemon dramatized *The Chimes* and other works of Charles Dickens at his request. He was the author of the *Comic History of England; Comic History of Rome; Comic Blackstone*, and *Quizziology of the British Drama*.

A′BECKETT, Gilbert Arthur (1837-91). An English journalist and dramatist, son of Gilbert Abbott A'Beckett (1811-56). He was born in London and studied at Westminster School and Christ Church, Oxford. He wrote many successful songs and the librettos of *Canterbury Pilgrims* and *Savonarola*, operas by Dr. Villiers Stanford, and was joint author, with Herman Merivale, of the poetic drama entitled *The White Pilgrim*. During the last twelve years of his life A'Beckett was one of the best-known contributors to *Punch*.

ABEEL, ȧ-bēl′, David, D.D. (1804-46). An early missionary to China. He was born in New Brunswick, N. J., June 12, 1804; graduated from the theological seminary of the Reformed Dutch Church in his native town, and became pastor in Athens, Greene County, N. Y., 1826. Failing health compelled his resignation after two years and a half; in 1829 he went to China as chaplain in the employ of the Seamen's Friend Society; in 1830 was transferred to the American Board of Commissioners for Foreign Missions. He traveled extensively through the Far East, and on his way home invalided he went over Europe and excited great interest in missions there, as he did later in America (1833-36). Again thinking himself well enough for service, he returned to China in 1838, but was compelled by his increasing debility to return home (1845) and died in Albany, N. Y., September 4, 1846. As one of the earliest and most devoted of missionaries he is still remembered. His addresses in London led to the formation of the Undenominational Society for Promoting Female Education in the East (1834); in 1844 he founded the Amoy Mission, now under the Reformed Dutch Church Foreign Mission Board. He published *Journal of a Residence in China* (New York, 1834; second edition, 1836); *The Missionary Convention at Jerusalem, or An Exhibition of the Claims of the Word of the Gospel* (1838). For his biography, consult G. R. Williamson (New York, 1848).

ABEILLE, ȧ′bâ′y′ *or* ȧ′bâl′, Jonas (1809—). A French military surgeon. He was born at St. Tropez and was educated at Montpellier. As the chief physician of the military hospitals of Paris he was one of the principal promoters of the method of treating cholera with strychnine. After 1857 he devoted himself more particularly to private practice and to scientific research. His publications include: *Mémoires sur les injections iodées* (1849; honored with a gold medal by the Medical Society of Toulouse); *Etudes cliniques sur la paraplégie indépendante de la myélite* (1854; prize awarded by the Medical Academy in 1855); *Chirurgie conservative* (1874); *Traitement des maladies chroniques de la matrice* (second edition, 1878).

A′BEL (Heb. *hĕbĕl*, perhaps kindred to Babyl. *ablu*, son). According to Genesis (iv : 2), the name of the second son of Adam and Eve. In contrast to his brother Cain, who is an agriculturist, Abel is a shepherd. At the close of the year, Cain offered up of the fruits of the field as a sacrifice to Jehovah, while Abel brought the firstlings of his flock. The latter's gift was regarded with greater favor by Jehovah, in consequence of which Cain's jealousy was aroused and he slew his brother Abel. (See Cain.) The story of Abel and Cain has been interpreted as expressing the superiority of the pastoral over the agricultural life. Abel, the shepherd, is a representative of the Palestinian nomad—though of the milder type—of which the patriarchs, Abraham, Isaac, and Jacob were examples; whereas Cain represents the Canaanites, who, at the time that the Hebrews entered the country, had already advanced to the agricultural stage. The Hebrews subsequently became agriculturists themselves, but, while the ideal held up in the Pentateuchal legislation is agricultural life, still the preference for the older nomadic conditions crops out from time to time, and as late as the days of Jeremiah we find a party known as the Rechabites who not only eschewed agricultural life, but continued to live in huts and would not taste wine, which was the symbol *par excellence* of agricultural pursuits. The story of Cain and Abel is conceived in the spirit of the Rechabites, just as there is a trace of the same spirit in the implied disapproval of vine culture in the tale of Noah's drunkenness (Genesis ix : 20-21). In rabbinical theology, however, and under the totally different view that was taken of early biblical traditions, Abel became the type of the pious, devoted worshipper of Jehovah who suffered martyrdom for his devotion. This view is reflected in the interpretation put upon the story in the New Testament where (e.g., Hebrews xi : 4) Abel's sacrifice is qualified as "better" than Cain's, and Abel himself becomes the "righteous" man, the possessor of true faith, in contrast to Cain the wicked (Matthew xxiii : 35; Luke xi : 51). The etymology of Abel is doubtful. The Jewish view, which gives to the name the force of "vanity," is untenable; but, on the other hand, to connect the name with the Assyrian *aplu* (or *ablu*), which means "son," is also open to serious objections, since there are no traces of Babylonian or Assyrian influence in the story itself.

ABEL, Carl, Ph.D. (1837—). A German philologist. He was born in Berlin, and after studying at the universities of Berlin, Munich, and Tübingen, acquired familiarity with all European and several Oriental tongues. He was at one time a lecturer at Oxford, taught philosophical and comparative linguistics at the Humboldt Academy of Science at Berlin, and was linguistic assistant in the German Foreign Office. His publications in German, French, and English are numerous. The works include *Linguistic Essays* (1880), *Slavic and Italian* (1881), and *Russland und die Lage* (1888).

ABEL, Sir Frederic Augustus, K.C.B., D.C.L. (1827-1902). An English chemist. He was born in London and devoted himself chiefly to the science of explosives. He was consulting chemist to the British War Department from 1854 to 1888, and was knighted in 1883. Abel introduced important improvements in the manufacture of gun-cotton and of blasting gelatine. He published: *Gun-cotton* (1866); *The Modern History of Gunpowder* (1866); *On Explosive Agents* (1872); *Researches in Explosives* (1875), and *Electricity Applied to Explosive Purposes* (1884). He wrote also, in conjunction with Colonel Blexam, a *Handbook of Chemistry*.

ABEL, John (1857—). An American physiological chemist. He was born in Cleveland, Ohio, received his education at the University of Michigan, and studied medicine in Germany. On his return to this country he became connected with the Johns Hopkins University, where he was made professor of pharmacology in the medical school and head professor of physiological chemistry. Dr. Abel's researches have formed valuable contributions to our knowledge of the fluids and tissues of the animal body.

ABEL, ä′bĕl, Karl Friedrich (1725-87). A German musician, celebrated as a player on the viola da gamba. He was born at Cöthen, became a pupil of Sebastian Bach, and was a member of the Royal Polish Band at Dresden. He went to England in 1759 and six years later became chamber musician to Queen Charlotte. He also won considerable distinction as a composer.

ABEL, ä′bĕl, Niels Henrik (1802-29). One of the most brilliant mathematicians of the first part of the nineteenth century. He was born at Findö, Norway. After a course of study at the University of Christiania, he spent two years in Paris and Berlin, and in 1827 was made instructor at the university and at the school of engineering in Christiania. He was the first to demonstrate with rigor the impossibility of solving by the elementary processes of algebra general equations of any degree higher than the fourth. His chief contributions were made to the theory of functions, of which he was one of the founders. An important class of elliptic functions (see Functions) are known as Abelian, from their discoverer. There are also Abelian groups and bodies. The Binomial Theorem (q.v.), proved by Newton and Euler, received at the hands of Abel a wider generalization, including the cases of irrational and imaginary exponents. Abel's works, in two volumes, were published by the Norwegian Government (Christiania, first edition, 1839; second edition, 1881).

ABÉLARD (Engl. ăb′ē-lärd; Fr. ȧ′bȧ′lär′), Pierre (1079-1142). A scholastic philosopher and theologian, the boldest thinker of the twelfth century. His name is commonly given in the French form, Abélard or Abailard; in Latin, Abailardus or Bajolardus. But these are epithets of uncertain meaning, the latter form perhaps from *bajulus*, "teacher," the former from *abeille*, a bee. He had properly the single name Peter, *Petrus*, to which was added *de Palais*, from the place of his birth, Le Pallet, or in Latin form Palatinus, a village eight miles southeast of Nantes, Brittany, western France. He was born in 1079. His father was the knight Berengar, lord of the village; his mother was Lucia, and they both later on entered monastic orders. An irrepressible thirst for knowledge and a special pleasure in scholastic logic moved Abélard to resign his rights of primogeniture in favor of his younger brothers. His first teacher was Roscellin, the Nominalist, during the latter's stay at Vannes. He wandered about in search of knowledge until he arrived in Paris, where he became a pupil of William of Champeaux, the Realist, the head of the cathedral school of Notre Dame there, but soon incurred the hatred of his master, whom he puzzled by his wonderful subtlety. He fled to Melun, where he started a school of his own, and afterward to Corbeil, admired, yet persecuted, wherever he went. He then returned home for the restoration of his health. With renewed strength, he returned to Paris, reconciled himself with his opponents, and molded, by his influence as a lecturer, some of the most distinguished men of his age, among whom were the future Pope Celestine II., Peter Lombard, Berengar, his future apologist, and Arnold of Brescia.

At this time, however, there also lived in Paris with her uncle, the canon Fulbert, Héloïse, the eighteen-year-old natural daughter of a certain canon John, of Paris, already remarkable for her beauty, talents, and attainments. At Fulbert's invitation Abélard made his home with him and instructed Héloïse. She soon kindled in the breast of Abélard, then thirty-eight years old, a violent and overwhelming passion, which was returned by Héloïse with no less fervor. The lovers were happy together until Abélard's ardent poetical effusions reached the ears of the canon. He sought to separate the lovers; but it was too late. They fled together to Abélard's home, where, in his sister Dionysia's house, Héloïse gave birth to a son, and was privately married to Abélard with the consent of her uncle. Not long after, Héloïse returned to Fulbert's house, and denied the marriage, that her love might be no hindrance to Abélard's advancement in the Church. Enraged at this, and at a second flight which she took with Abélard to the Benedictine nunnery at Argenteuil, where she had been educated, a flight which Fulbert interpreted as showing Abélard's desire to rid himself of his wife, Fulbert, in order to make him canonically incapable of ecclesiastical preferment, caused Abélard to be emasculated. In deep humiliation Abélard entered as a monk the abbey of St. Denis, in Paris, and induced Héloïse to take the veil at Argenteuil.

But the lectures which he began to give soon after exposed him to new persecutions. The synod of Soissons (1121) declared his opinions on the Trinity to be heretical. In punishment he had to throw the offending treatise into the fire, to read publicly the Athanasian Creed, and to endure a brief imprisonment. The charge seems to have been that he declared God the Father alone omnipotent. But what cost him more was his declaration that St. Dionysius, the patron saint of France, had been bishop of Corinth, and not of Athens, for this stirred up court opposition. He fled from St. Denis to the monastery of St. Aigulph, near Provins, but was brought back and compelled to retract his opinions concerning St. Dionysius. He was then allowed to go, and went to Nogent-sur-Seine, and there built of reeds and rushes a little chapel to the Trinity, and later, on account of the press of hearers, who planted their huts about him, a structure of wood and stone, which he called the Paraclete, the ruins of which exist to this day. But as everything he did caused adverse criticism, so the name that he gave the building—because it brought into unusual prominence the Holy Spirit—involved him in fresh trouble, and he left the Paraclete and accepted the abbotship of St. Gildas de Rhuys, on the coast of Lower Brittany. It was a sore trial for him to contend with the unruly monks. Meanwhile, the convent at Argenteuil, where Héloïse was prioress, had been broken up. Abélard transferred Héloïse and her nuns to the Paraclete and made her abbess of the nunnery he established. It was a long distance from St. Gildas, but, as spiritual director, he frequently went thither. Naturally, he fell under suspicion of renewing his intimacy with Héloïse, and so the lovers finally restricted themselves to writing. The correspondence has been preserved. On his part it was sternly repressive, to the point of coldness; on her part the heart expressed its love, which was an inextinguishable passion, both of body and soul, and tyrannical in its demands upon the monk who had ceased to share it.

After ten more years, Abélard, fearing an attack upon his life, left his monks and became a wandering teacher again. Two men, Norbert and the much more famous Bernard of Clairvaux, were always on his track. The Council of Sens, held in 1141, under the influence of Bernard, condemned his teachings. Abélard appealed to the Pope, Innocent II., and the latter confirmed the finding of the council and ordered his imprisonment and the burning of his writings. Abélard submitted, reconciled himself with Bernard, and was on his way to Rome to undergo his punisment, when he came, worn out, to the great monastery of Cluny. Through the friendly offices of Peter the Venerable, its noble abbot, he received permission to retire thither and a release from the order of imprisonment. He had not long to live, but the time was well spent in religious exercises and in occasional teaching. He had the scurvy, and when his ills increased he was removed to the priory of St. Marcel at Chalon-sur-Saône, where the air was better, it was thought. There he died, on April 21, 1142. His body was brought to the Paraclete. Héloïse died there May 16, 1164, and was laid beside him. In the cemetery of Père-la-Chaise in Paris their bones are now united in one tomb, erected in 1817. The figure of Héloïse is really that of a lady of the Dormans family, and was originally in the chapel of the old Collège de Beauvais.

The loves of Abélard and Héloïse have made them immortal, but Abélard also has importance as a philosopher. He followed John Scotus Erigena, the ninth century philosopher, in his rationalism. He planted himself on Aristotelian ground (although all he knew of Aristotle was derived from Latin quotations), and did much to overthrow the prevalent realism. His great service in the development of ethics was in his treatment of conscience by dwelling upon the subjective aspect. He also has great importance as the virtual founder of the University of Paris, in a sense the mother of mediæval, and so of all modern, universities. This claim may be made for him because he first established schools independent of the monastic and episcopal schools. In Melun, in Corbeil, and then in Paris, at Nogent-sur-Seine, he had thousands of pupils, and gave an extraordinary impetus to learning and speculation. His example as an independent teacher was followed. Out of such gatherings of students at a later date the universities were evolved. By his appeal to reason instead of authority, he showed the path to intellectual freedom, and thus became the prophet of the freedom of speech and research for which the universities properly stand. In both these respects his pedagogical importance is great, and so his particular opinions and errors are of comparatively small moment.

His works, all written in Latin, first printed at Paris, 1616, are in Migne, *Patrol. Lat.*, clxxviii. (Paris, 1855); also as edited by Victor Cousin: *Ouvrages inédits d'Abélard* (Paris, 1836); *Opera* (1849-59, 2 volumes); to which should be added his *Sic et Non*, editors, E. L. T. Henke and G. L. Lindenkohl (Marburg, 1851); *Planctus Virginum Israel super filia Jeptæ Galaditæ*, editors, W. Meyer and W. Brambach (Munich, 1886); *Tractatus de Unitate et Trinitate* [discovered, edited, and published by R. Stölzle under title: *Abélards 1121 zu Soissons verurtheilter Tractatus, etc.*] (Freiburg-im-Breisgau, 1891); his *Hymnarius Paraclitensius*, editor G. M. Dreves (Paris, 1891). The letters of Abélard and Héloïse have very often been published and translated, e.g., the Latin text and the French translation by Gréard (Paris, 1885); complete English translation by J. Berington, with the Latin text, *The History of the Lives of Abeillard and Héloïse* (Birmingham, 1788), edited by H. Mills (London, 1850); O. W. Wight, *Lives and Letters of Abélard and Héloïse* (New York, 1861). Consult: A. S. Richardson, *Abélard and Héloïse* (New York, 1884), with selections from their letters; H. Morton, *Love Letters of Abélard and Héloïse* (New York, 1901), and the standard biography of Abélard by C. de Rémusat (Paris, 1855). For recent literature concerning him, consult: H. Hayd, *Abälard und seine Lehre im Verhältniss zur Kirche und ihrem Dogma* (Ratisbon, 1863); H. V. Sauerland, *Abälard und Héloïse* (Frankfort, 1879); P. Tiby, *Deux couvens au moyen âge, ou l'abbaye de Saint Gildas et le Paraclet au temps d'Abélard et d'Héloïse* (Paris, 1851); C. A. Wilkens, *Peter Abälard* (Bremen, 1851); C. de Rémusat, *Abélard*, a drama (Paris, 1877); S. M. Deutsch, *Abälards Verurtheilung zu Sens, 1141, nach den Quellen kritisch dargestellt* (Berlin, 1880); E. Vacandard, *Abélard, sa lutte avec Saint Bernard, sa doctrine, sa méthode* (Paris, 1881); S. M. Deutsch, *Peter Abälard, ein kritischer Theologe des zwölften Jahrhunderts* (Leipzig, 1883); A. Hausrath, *Peter Abälard* (Leipzig, 1893); G. Compayré, *Abélard and the Origin and Early History of Universities* (New York, 1893); F. Thaner, *Abälard und das canonische Recht* (Gratz, 1900); J. McCabe, *Peter Abélard* (New York, 1901).

ABEL DE PUJOL, à'bĕl' de py̆'zhôl', Alexandre Denis (1785-1861). A French historical painter. He was born at Valenciennes, and was a pupil of the famous David, whose classicism he followed. In 1811 he won the Grand Prix de Rome with "Jacob Blesses the Children of Joseph." He painted numerous frescoes in St. Sulpice and other churches, in the Bourse, the Louvre, and Fontainebleau. In 1835 he was elected a member of the Academy of Fine Arts. His other works include "The Death of Britannicus" (first medal, 1814), "Cæsar on the Day of His Assassination," "The Baptism of Clovis" (in the cathedral of Rheims), and "Peter Raises the Dead."

ABELE, à-bēl'. See Poplar.

ABELIN, ä'be-lên, Johann Philipp (?-1633?). A German historian. He wrote under the names Philipp Arlanibäus, Abeleus, and Johann Ludwig Gottfried, or Gothofredus. He produced a number of works still consulted, including the *Arma Suecica* (1631-34), and the *Inventarium Sueciæ* (1632), descriptions of military events of the time. He also founded the *Theatrum Europœum* (1635-1738), a serial work on contemporary history, for which he compiled the first two volumes. Others of his publications are a *Historische Chronika* (1633) and an *Historia Antipodum* (1655). See Droysen, *Arlanibäus, Godofredus, Abelinus* (1864).

ABELITES, ā'bĕl-īts, or **ABELONIANS**, ā'bĕl-ō'nĭ-anz. A very small Christian sect of the fourth and fifth centuries, found in the neighborhood of Hippo, in North Africa. Their chief distinction consisted in marrying but abstaining from matrimonial intercourse, in order not to propagate original sin. They kept up their numbers by adopting children. They held that Abel so lived, because the Bible mentions no children of his.

ABEN, ä'bĕn. A form used in the transliteration of Oriental names instead of the more correct *Ibn* ("son").

ABENCERRAGES, ȧ-bĕn′se-rā′jez; *Sp. pron.* ȧ-bĕn′thȧ-rä′Hȧs. According to legend, a noble Moorish race whose struggles with the family of the Zegris and tragical destruction furnish the material for the historical romance *Las guerras civiles de Granada*, by Gines Perez de Hita (Saragossa, 1595). From this Chateaubriand composed the novel *Le dernier des Abencérages.* There was actually a family of Abencerrages, powerful in the first quarter of the fifteenth century, but their history has been so embellished by legend that it is difficult to say what is true and what is imaginary.

ABEN-ESRA, ä′bĕn ĕz′rȧ, properly Abraham-ben-Meir-ibn-Esra (1092-1167). One of the most learned Jews of his time. He was born in Toledo, Spain. He died January 23, 1167. He was master of the Hebrew, Arabic, and Aramaic languages; had considerable knowledge of mathematics, astronomy, and medicine; was a scientific observer and a poet, and generally distinguished himself as a sagacious thinker. He visited Lombardy, Provence, France, Egypt, and England, and passed the later years of his life in Rome, everywhere teaching grammar, theology, astronomy, etc., besides writing works on Hebrew grammar and composing numerous poems. His *Commentaries on the Old Testament* are the most important of his works, though his scientific method occasioned opposition upon the part of the Talmudists. He also produced some treatises on astrology, since published in Latin. The scholastic writers mention Aben-Esra as Abenare or Avenard. An English translation of his *Isaiah* has been made by M. Friedländer (London, 1873), of his *Canticles* by H. J. Mathews, with original text in Friedländer, *Miscellany of Hebrew Literature*, vol. ii. (London, 1877).

ABENSBERG, ä′bĕns-bĕrK. A town in Lower Bavaria, Germany, situated 18 miles southwest of Ratisbon (Map: Germany, D 4). It has warm springs and ruins of a castle. On April 20, 1809, Napoleon here defeated the Austrians and opened the way for the victory of Eckmühl. Pop., 1900, 2202.

ABEOKUTA, ä′bȧ-ŏ-kōō′tȧ. A large city in Yoruba, on the Slave Coast, north of Lagos, with which it is connected by rail (Map: Africa, E 4). It is situated on an elevated plain and is surrounded by a high mud wall. It occupies an extensive area, but its general appearance is that of a very large village. Abeokuta was founded about 1825 as a result of the slave-hunting expeditions of the natives of Dahomey and Ibadon. It was founded primarily on the lines of a confederation for mutual protection, each tribe, however, preserving its individual rights and customs. The population is estimated at from 80,000 to 130,000, and consists of about 60 different tribes. The inhabitants are chiefly artisans and traders, and show much skill in their buildings and textiles.

ABERBROTHWICK, ăb′ẽr-brŏth′ĭk. See Arbroath.

AB′ERCARN (Celtic *aber*, confluence of rivers + Gael. *carn*, a conical heap of stones). A town in Monmouthshire, England, five and one-half miles southwest of Pontypool. It is a progressive municipality, owning waterworks and cemeteries. Population, mostly engaged in coal mining, 1891, 10,400; 1901, 12,600.

ABERCROMBIE, ăb′ẽr-krŭm′bĭ, James. See Abercromby, James.

ABERCROMBIE, John (1780-1844). An eminent Scotch physician. He was born at Aberdeen, and graduated in medicine at Edinburgh in 1803. He practiced his profession in the Scottish capital, and soon became recognized as the first consulting physician in Scotland. Among the honors bestowed upon him were the degree of M.D. from Oxford, the rectorship of Marischal College, the vice-presidency of the Royal Society of Edinburgh, and the office of physician in ordinary to His Majesty for Scotland. Besides his professional writings he published *Inquiries Concerning the Intellectual Powers* (Edinburgh, 1830), and *Philosophy of the Moral Feelings* (London, 1833), both of which attained a remarkable popularity. They championed the views of the Scotch school as represented by Dugald Stewart, but had no originality, and therefore have now little philosophical value.

ABERCROMBY, ăb′ẽr-krŭm′bĭ, or Abercrombie, James (1706-81). A British soldier, born at Glassbaugh, Scotland. He entered the army as colonel in 1746, and was raised to the rank of major-general and sent to America in 1756, where in 1758 he replaced Loudon as commander-in-chief of the British and colonial forces. On July 8, 1758, at the head of 15,000 men, he attacked Ticonderoga (q.v.), but was repulsed with a loss of fully 2000 men. This attack was the culmination of a career of incapacity, and in September he was superseded by Sir Jeffrey Amherst. Returning (1759) to England, he became a member of Parliament, and was conspicuous as an upholder of George III.'s colonial policy. For his record as an officer in America, consult: Parkman, *Montcalm and Wolfe* (Boston, 1884).

ABERCROMBY, Sir Ralph (1734-1801). A distinguished British general. He was born at Menstry, near Tullibody, Scotland, October, 1734. He was educated at Rugby, and studied for the legal profession at Edinburgh and Leipzig, but preferred the army, and a cornet's commission was obtained for him in 1756. In 1758 he accompanied his regiment to Germany, where he saw active warfare, and gained experience in army management. At the conclusion of peace, he was stationed in Ireland for several years. He married in 1767, and by 1773 had risen to the rank of lieutenant-colonel. He entered Parliament after a bloodless duel with his defeated opponent, and strongly opposed the American war, a course particularly honorable, as he desired active service. The war with France gave him his opportunity. Family influence and his reputation procured his promotion to be major-general of a brigade ordered to Flanders, where he distinguished himself so highly as to be publicly thanked by the Duke of York. Under him the Duke of Wellington, then Lieutenant-Colonel Wellesley, commanding the Thirty-third Regiment, received his baptism of fire. Abercromby was knighted on his return to England in 1795, and was surprised to find himself famous as his country's greatest general. The disastrous campaign, however, had shown him the deterioration in army discipline, and his energies were devoted to the reorganization of the whole army system. In 1796 he conducted a successful expedition to the West Indies. In 1797 he went to

Ireland as commander of the forces. He strongly condemned the governmental policy toward that country, however, and this caused his resignation; but he was at once given a similar appointment in Scotland. In 1799 he was placed in command of the expedition to Holland and began it brilliantly; but he was superseded by the Duke of York, and the campaign ended ignominiously. Abercromby alone acquitted himself with credit, and the ministry wished to make him a peer, but he refused to have his name associated with a failure. In 1800 he commanded the expedition to the Mediterranean, and after some brilliant operations defeated the French in the battle of Alexandria, March 21, 1801. During the action he was struck by a musket-ball in the thigh; but not until the battle was won and he saw the enemy retreating did he show any sign of pain. He was borne from the field in a hammock, cheered by the blessings of the soldiers as he passed, and conveyed on board the flag-ship *Foudroyant*. The ball could not be extracted; mortification ensued, and seven days later, on March 28, 1801, he died. Abercromby was at once gentle and brave, clear-sighted and cool in deliberation; in action, prompt and daring. Apart from his qualities as a soldier, he was a man of liberal accomplishments, free from prejudices, and of sound practical judgment. The national gratitude to this eminent man took the form of a peerage conferred on his widow, afterward enjoyed by his eldest son, with the title of Baron Abercromby. **Consult:** J. Abercromby, *Memoir of the Life of Sir R. Abercromby* (Dublin, 1801); J. Abercromby, Baron Dunfermline, *Memoir of Lieutenant-General Sir Ralph Abercromby* (London, 1861).

ABERDARE, ăb′ẽr-dâr′. A town in Glamorganshire, Wales, on the right bank of the Cynon, four miles southwest of Merthyr-Tydvil. It is situated in a rich mineral district, having extensive coal, iron, and tin works (Map: Wales, C 5). Aberdare is connected with the coast by a canal and railway. Its growth has been remarkable. From an unimportant village of 6500 inhabitants in 1841 it has developed into a thriving town of 38,431 in 1891 and 43,357 in 1901.

AB′ERDEEN′ (Celtic *aber*, confluence of waters, i.e., of the Don and Dee). The fourth largest city of Scotland, and the capital of Aberdeenshire. It is situated in the southeastern part of the county, on the North Sea, about 95 miles north of Edinburgh (Map: Scotland, F 2). It forms the chief part of a parliamentary burgh of the same name, and comprises all the territory lying between the rivers Dee and Don, thus including what was formerly known as Old Aberdeen. It has a mean temperature of about 46° F., and is about 66 feet above the sea level. Aberdeen is a handsome city, largely built of granite quarried in the neighborhood, and is therefore known as the "Granite City." Its streets are for the most part regular and well paved. Union Street, its principal thoroughfare, has been described as one of the handsomest streets in Europe, and contains many of the notable public buildings. Chief among them are the municipal and county buildings, an imposing structure in the Scotch baronial style. Nearby is "The Cross," a curious monument adorned with medallions of Scottish monarchs. At the western end of Union Street are the Music Hall buildings, particularly notable in point of architecture, and the Trades' Hall, in which are kept the shields of the different incorporated trades. Several of the bank buildings are tasteful edifices. The east and west churches, although comparatively modern, are interesting from the fact that they are built on the site of the ancient church of St. Nicholas, and are connected by an old wooden tower. Among the many other churches of Aberdeen the Roman Catholic church is notable for its beautiful spire, two hundred feet high, and the cathedral of St. Machar, begun in 1357, for its severe simplicity of style. The River Dee is crossed by four bridges, one of which, a stone bridge, dates from 1527.

Among its advantages the city has an excellent harbor and immense floating docks, enabling it to carry on a large maritime trade in textile goods, agricultural products, and granite. It is a large manufacturing centre, the chief industries including cotton spinning, manufacture of cotton, woolen and linen goods, iron foundries and paper mills. Granite cutting and shipbuilding are also quite important, although the latter industry has diminished in importance since the days of wooden vessels, when the Aberdeen clippers were famous. Aberdeen's means of communication are excellent. It is at the junction of three railway lines, and is connected by steamer with Leith, Newcastle, Hull, and London. Its own shipping comprises about 180 steam and 40 sailing vessels, tonnage about 100,000. Annually 3000 vessels, representing a gross tonnage of nearly 2,000,000, clear the port. The chief exports are fish, spirits, cloth manufactures, coal products, stone, etc., and the chief imports barley, wheat meal, maize, oats, flaxseed, sugar, timber, paper-making materials, etc. The total value of imports and exports averages annually £1,100,000 ($5,500,000). Aberdeen is the fourth port of importance in Scotland. The United States is represented there by an agent.

Aberdeen sends two members to Parliament, and is one of the most progressive of municipalities. It has the usual authorities, consisting of a lord provost, bailies, councilors, etc. (See GREAT BRITAIN, paragraph on *Government.*) The city owns and operates its water and gas works and an electric light plant, as well as its electric tramways, and maintains public baths, markets, and two cemeteries. It is one of the few municipalities which have taken up the question of the proper housing of the working people, and as a result it has established a lodging house and erected several workmen's dwellings. Aberdeen's educational institutions are very numerous, and include the University of Aberdeen (q.v.), established in 1860 by the consolidation of King's College of Old Aberdeen, founded in 1494, and Marischal College of New Aberdeen, founded in 1593. In the year 1904-5 there were about 1100 students in attendance. The university library contains about 140,000 volumes. Among the other colleges and schools are Gordon's College, which receives a yearly grant from the city, an art school, a navigation school, an ancient grammar school dating from 1263, the Free Church Divinity College, and the Mechanics' Institution. Among the benevolent and charitable institutions are the Royal Infirmary, an epidemic hospital and one for incurables, a large lunatic asylum, and a poorhouse. The city has two fine public parks. Aberdeen appears in the twelfth century as a populous town. William the Lion granted it a charter in 1179 and Robert Bruce extended its privileges. The English burned the town in 1336, but it was rebuilt as New Aberdeen. It suffered severely during the civil wars of the seventeenth century. A period of great prosperity began in 1818, with the rediscovery of the art of granite polishing. Population of royal, parliamentry, and municipal burgh, 1891, 123,000; 1901, 153,108, 9386 of whom overflowed into Kincardineshire; 1904 (est.), 164,124.

ABERDEEN. A city and county seat of Monroe County, Miss., about 140 miles southeast of Memphis, Tenn., on the Kansas City, Memphis, and Birmingham, the Illinois Central, and the Mobile and Ohio railroads, and on the Tombigbee River (Map: Mississippi, J 3). It has an oil mill, grist-mills, lumber mills, and cotton-gins, and manufactures clothing, brick, ice, furniture, and buttons. It is an important cotton market. Pop., 1900, 3434; 1906 (local est.), 3650.

ABERDEEN. A city and county seat of Brown County, S. D., 280 miles west of Minneapolis, Minn., on the Chicago, Milwaukee, and St. Paul, the Chicago and Northwestern, and the Great Northern railroads (Map: South Dakota, G 4). It has a public library (Carnegie) and is the seat of a State normal school. Other prominent features are the Federal building, courthouse, and St. Luke's Hospital. The city has important commercial interests, and manufactures flour, brick, chemicals, and artesian well supplies. There also are several grain elevators and creameries. Settled in 1880, Aberdeen was incorporated in 1882. The government is administered under a charter of 1890, which provides for a mayor, elected biennially, and a council. The water-works are the property of the municipality. Pop., 1890, 3182; 1900, 4087; 1905, 5841.

ABERDEEN. A city in Chehalis County, Wash., 50 miles (direct) west of Olympia, at the head of Grays Harbor, and on a branch of the Northern Pacific Railroad (Map: Washington, B 2). It is surrounded by a heavily timbered region, and has several saw-mills and wood-working factories. Fruit growing and dairying also are of some importance. Pop. in 1890, 1638; in 1900, 3747.

ABERDEEN, fourth EARL OF, GEORGE HAMILTON GORDON (1784-1860). A British statesman, born at Edinburgh. He was educated at Harrow, and in 1804 took the M.A. degree at St. John's College, Cambridge. In 1801 he had succeeded to the earldom and made a journey through Greece, which is perpetuated by Byron's satirical distich,

> "First in the oat-fed phalanx shall be seen
> The traveled thane, Athenian Aberdeen."

He was elected a Scotch representative peer and took his seat as a Tory in December, 1806. In 1813 he was appointed Ambassador Extraordinary to Austria, where he gained the friendship of Metternich, whom he considered a pattern of diplomacy. He signed the Treaty of Paris as one of England's representatives. He was raised to the peerage as Viscount Gordon. He was foreign secretary under Wellington, 1828 to 1830, and under Peel, 1841 to 1846, in 1834 and 1835 acting as Peel's war secretary. The general principle which guided his policy as secretary of state for foreign affairs was that of non-interference in the internal affairs of foreign States, which, joined to his well-known sympathy with such statesmen as Metternich, exposed him—not always justly—to the suspicion of being inimical to the cause of popular liberty. His gradual abandonment of high Tory principles was evinced by his support of the bill for the repeal of the test and corporation acts and of the Roman Catholic Emancipation Act. The conclusion of the Chinese War, the Ashburton Treaty, and the Oregon Treaty were the principal services rendered to the country during his administration. In 1852, on the resignation of Lord Derby, the extraordinary state of parties necessitated a coalition, and Lord Aberdeen was selected to head the new ministry, which for some time was extremely popular. The feeble and vacillating policy displayed in the conduct of the war with Russia gradually undermined its stability, and the disastrous mismanagement brought to light in the winter of 1854, in all departments of the public business connected with the war, filled up the measure of popular discontent, and led to his resignation in 1855. He died in London. Consult: Gordon, *Earl of Aberdeen* (London, 1893).

ABERDEEN, seventh EARL OF, SIR JOHN CAMPBELL GORDON (1847—). A British statesman. Educated at St. Andrews and Oxford; in 1880 was appointed Lord Lieutenant of Aberdeenshire, and from 1881 to 1885 was lord high commissioner to the general assembly of the Church of Scotland. From January to July, 1886, he was Lord Lieutenant of Ireland, from 1893 to 1898 Governor-General of Canada, and in 1905 became Lord Lieutenant of Ireland on the accession of the Liberals to power.

ABERDEEN, UNIVERSITY OF. A university founded in 1494 by the Bishop of Aberdeen, William Elphinstone. In 1505 the College of St. Mary, later King's College, was founded within the university. In 1593 Marischal College was founded by George Keith, Earl Marischal of Scotland. In 1860 these were united by act of Parliament into the University of Aberdeen. The students retain the old divisions into four nations, Mar, Buchan, Moray, Angus. The officers are a chancellor, rector, vice-chancellor, and two secretaries. There are a number of bursaries or scholarships, aggregating over £7800. The students number about 1100. There are faculties of arts, science, theology, law, and medicine, with about thirty professors and many assistants. The university has a library of over 140,000 volumes and several museums. The university is a beneficiary of the Carnegie Trust Fund. See SCOTLAND, section *Education*.

AB'ERDEEN'SHIRE. A maritime county of Scotland; bounded north by Banffshire and the North Sea; east, by the North Sea; south, by Kincardine, Forfar, and Perth shires; west, by Inverness and Banff shires (Map: Scotland, F 2). Its greatest length is 102 miles; its greatest breadth, 50 miles, with an area of 1955 square miles. It is popularly divided into five districts, Mar, Strathbogie, Garioch, Formartin, and Buchan. Among the principal towns are Aberdeen, the capital, Peterhead, and Turriff. The chief industries are connected with agriculture and sea fisheries. Pop., 1801, 121,100; 1901, 304,400. Consult: A. Smith, *History of Aberdeenshire* (Aberdeen, 1875).

AB'ERDEVINE'. A species of goldfinch. See SISKIN; also PINEFINCH.

ABERGAVENNY, ăb'ẽr-găn'nĭ, *or* ăb'ẽr-gȧ-vĕn'nĭ (the Roman *Gobannium*). A market town of Monmouthshire, England, 13 miles west of Monmouth, beautifully situated in the valley of the Usk (Map: England, D 5). The town is regularly and compactly built, and many improvements have of late years been made. It was incorporated in 1899. St. Mary's Church, which was once a fine cruciform structure, and contains many interesting monuments, has been spoiled by restorations. The castle, built by Hammeline de Baladun, soon after the Conquest, is now a ruin. There are collieries and iron works in the neighborhood. Pop., 1891, 7700; 1901, 7800.

AB'ERNE'THY. A village in Perthshire, Scotland, on the Tay, about six miles southeast of Perth (Map: Scotland, E 3). It is believed to have been the capital of the Picts, and for many years in the ninth century was the seat of the only bishopric in Scotland. It is chiefly notable, however, for its ancient round tower, like which there is only one other in Scotland. Pop., 1901, police burgh, 623; civil parish, 1276.

ABERNETHY, JAMES (1815-96). A Scotch civil engineer. He was born at Aberdeen. In 1841 he was resident engineer of the Aberdeen harbor works, and from 1842 to 1852 was surveying officer for the Admiralty. He was the first to apply hydraulic power to the working of lock-gates, and constructed such important works as the Birkenhead docks, the Hull docks, and the Turin and Savona Railway (Italy). He was also the director of the works for the draining of Lake Abukir, Egypt, by which twenty thousand acres were reclaimed. In 1881 he was elected President of the Institute of Civil Engineers.

ABERNETHY, JOHN (1680-1740). An Irish dissenting minister. He was born at Colerain, Ireland, the son of a dissenting Presbyterian minister; was educated at Glasgow and Edinburgh, and was licensed to preach before he was twenty-one years old. He was ordained at Antrim in 1703; in 1717 he was invited to a congregation in Dublin and another in Belfast, while Antrim desired him to remain. The synod was appealed to and decided that he should go to Dublin, but he declined and remained at Antrim. This refusal to obey the synod was unheard of and was considered ecclesiastical rebellion, and a fierce controversy ensued, the parties dividing into "subscribers" and "non-subscribers." Though himself strictly evangelical, Abernethy and his associates were remotely the occasion of the contest which ended in eliminating Arian and Socinian elements from the Irish Presbyterian Church. In 1726, Abernethy and all the "non-subscribers" were turned out with due ban and solemnity, but only four years afterward he was called to a "regular" congregation in Dublin. In 1731, in the controversy regarding the test act, Abernethy took broad ground "against all laws that, upon account of mere differences of religious opinions and forms of worship, excluded men of integrity and ability from serving their country." He was a century ahead of the time, and had to argue against those who denied that a Roman Catholic or a dissenter could be a "man of integrity and ability." Abernethy was foremost where unpopular truth and right were to be maintained, and his *Tracts*, collected after his death, did good service for generations. He died in Dublin, December, 1740. Consult Drechal, *Sermons of John Abernethy, with his Life* (London, 1748-51).

ABERNETHY, JOHN (1764-1831). An eminent English surgeon. He was born in London. He was a pupil of John Hunter; in 1787 was appointed assistant-surgeon of St. Bartholomew's Hospital, and in 1815 chief surgeon. Soon after his appointment he began to lecture in the hospital on anatomy and surgery, and may be said to have laid the foundation of its character as a school of surgery. His clear, simple, and positive style, illustrated by an inexhaustible variety of apt anecdotes, made him the most popular medical teacher of his day. In 1813 he was appointed surgeon to Christ's Hospital, and in 1814 professor of anatomy and surgery to the College of Surgeons. His practice increased with his celebrity, which the singular eccentricity and occasional rudeness of his manners contributed to heighten. Of his works, the most important are his *Observations on the Constitutional Origin and Treatment of Local Diseases* (1806), and his *Lectures on the Theory and Practice of Surgery* (1830).

AB'ERRA'TION, CHROMATIC (from Lat. *ab*, away + *errare*, to wander, and Gk. *Χρῶμα*, *chrōma*, color, literally colored deviation). A phenomenon observed when images of an object emitting white light are formed by a lens or a prism, it being observed that there is then not one white image, but many colored ones, which do not occupy the same position, and which are of different sizes, thus producing a blurred image with a colored border. It is explained in the article LIGHT that the sensations of different colors are due to waves in the ether of different wave-number or wave-length, and that these waves, in passing through portions of transparent matter, such as glass, travel with different velocities, depending upon their wave-number. As a consequence of this, in passing through lenses or prisms, waves of different wave-number have different paths. White light is shown to be due to the reception by the eye of waves of different wave-number; or, in other words, from a "white object," or an object "emitting white light," waves of different wave-numbers proceed outward. These waves are such that each train of waves of a definite wave-number would produce in the eye a definite color-sensation, e.g., blue, green, etc. In this sense we may speak of "blue-waves," "green-waves," etc.; and in general white light is due to the reception by the eye of waves which correspond to the "colors of the spectrum"—violet, blue, green, yellow, orange, red, and all the intermediate shades. Therefore, owing to this difference in path in a lens or prism of waves of different color, if an image of a white object is formed there will be a series of images corresponding to the different colors, these images differing in position and size, as well as in color. This result is said to be due to the "chromatic aberration" of the lens or prism. (There are, of course, ether-waves which do not affect the sense of sight; and any prism or lens which is transparent to them will in general deviate waves of different wave-number differently, and so have this same kind of aberration, as ordinary glass lenses have for visible waves.) Mirrors do not have chromatic aberration, as there is no refraction of the rays. Moreover, it is possible, by combining two or more prisms or lenses, to diminish greatly the aberration. (See ACHROMATISM.) The colors which are not thus brought to the same focus form the "secondary spectrum."

Reference to the diagrams will possibly serve to explain the matter more fully. Fig. 1 shows the dispersion (q.v.) of a beam of white light on passing through a prism, or, in other words, its separation into its constituent colors.

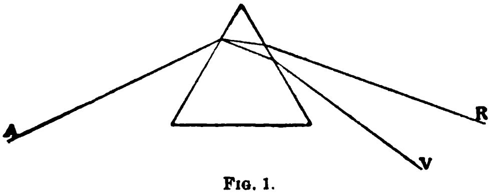


FIG. 1.

In fig. 2 let MN represent a convex lens, which may be considered as consisting of a number of prisms and having the same dispersive effect. Let A represent a source of white light. Considering a pencil which falls on the lens at c, where it is refracted, it is found that dispersion takes place, and the red rays after being deviated proceed to D, where an image of the object A is formed, while the violet rays which undergo greater refraction proceed to C, and there form an image of the object A. Consequently, if the image at C is examined with an eye-piece, or allowed to fall on a screen, it will be found to have a red border, while that at D will be seen surrounded by violet. When correction is made for chromatic aberration, the purpose for which the lens is designed must be considered. (See TELESCOPE.) For photographic work the violet rays are required, and any correction (see ACHROMATISM) should aim to bring them to the desired focus. For a visual telescope or microscope the yellow rays must be considered, and such a combination of lenses made that they are brought to the same focal plane. The chapters on optics in Müller-Pouillet's *Lehrbuch der Physik* (Brunswick, 1897) treat the subject most fully, as does Glazebrook's *Physical Optics* (London, 1898). The correction of this evil in photographic lenses is extensively treated from the theoretical standpoint in S. P. Thompson's translation of Lummer's *Photographic Optics* (London, 1900). See also Wood's *Physical Optics* (New York, 1905).

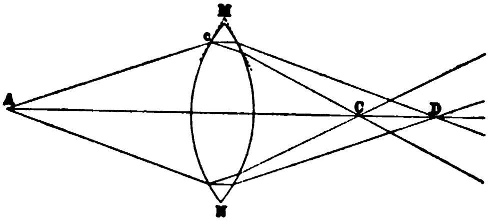


FIG. 2.

ABERRATION, SPHERICAL. A term used in geometrical optics (see LIGHT) to express the difference in path and effect of rays of light incident perpendicularly and obliquely upon a mirror or upon a surface separating two portions of transparent matter, e.g., upon a surface of water. If a source of light is very small, it can be called a "point-source," and can be considered as sending out "rays of light" in all directions, like the radii of a sphere. If one of these rays is perpendicular to the surface of the mirror or to the surface of separation of the two media, the rays near this will form a small cone or "pencil of rays;" and in optics it is shown that such a perpendicular pencil of rays always gives rise by reflection or refraction to another pencil of rays which meet in a point called the "image" or "focus" of the point-source. If, however, a small cone or pencil of rays be chosen around a ray which falls obliquely on the mirror or separating surface, it will give rise by reflection or refraction to rays which do not form a cone and therefore do not have a point as a focus, except in the case of a plain mirror, such as an ordinary looking-glass. If the incident pencil is narrow, the reflected or refracted rays will have two foci, in the form of two short, straight lines, some distance apart and perpendicular to each other. These are called "focal lines;" and in between them the rays come the closest to forming a point focus, producing what is called the "circle of least confusion." If instead of considering a narrow pencil of rays, we study the whole bundle of rays falling on the entire reflecting or refracting surface, it is evident that the rays are brought to a focus on a surface which can be thought of as due to the combined effect of the short focal lines produced by the individual pencils of which the bundle of rays is composed, and which has a cusp or projecting point ending at the point-focus due to the perpendicular pencil. A section of this "caustic surface" is often seen on looking down on a cup of coffee or a glass of milk, if there is a lighted lamp near; because the projecting sides of the cup or glass act as a curved mirror. An immediate consequence of spherical aberration is that the image formed of any object by a curved mirror or by a lens or prism is not "sharp," but blurred, unless care be taken to exclude the oblique rays. This is done ordinarily by the use of diaphragms, such as are seen in opera-glasses, photographic lenses, etc. The smaller the opening in the diaphragm, so much the sharper is the image. See CAUSTIC.

The accompanying diagrams will show the effect of spherical aberration in the case of spherical and parabolic mirrors and convex lenses. In fig. 1 parallel rays are incident on a spherical mirror. Those falling perpendicularly or near the centre of the mirror are reflected to the point Q, which is termed the principal focus of the mirror. The rays which strike the surface more obliquely do not meet at Q after reflection, but at points which lie on the caustic surface whose section is represented by the

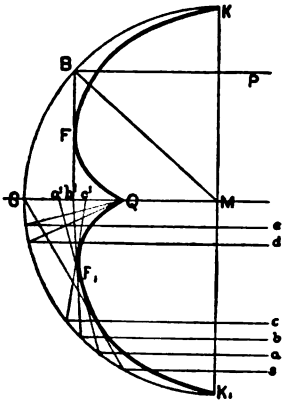


FIG. 1.

heavy line with a cusp at Q. In fig. 2 the elimination of spherical aberration by the use of a parabolic mirror is shown, as here, by the peculiar property of a parabola (q.v.), all rays parallel to the axis are brought to a point at F, called the focus. For this reason the parabolic mirror is theoretically the most available for telescopes (q.v.), but in practice the construction of such mirrors presents great difficulties, which are but rarely effectually surmounted. The effect of spherical aberration in the case of a lens is indicated in fig. 3, where the rays passing through the lens near its circumference are brought to a focus at C, while those lying nearer the axis AB meet at or near F. The foci for intermediate rays lie between that point and C. From these diagrams the advantages obtained by the use of diaphragms will be seen. The oblique rays, or those which strike the mirror or lens at a distance from its centre, and which do not come to a focus at the same point as those passing through the central portion, are accordingly cut off and the image rendered more distinct. The spherical aberration of lenses can be reduced by using two or more lenses in combination, as is done in the case of most photographic objectives. Two lenses with equal focal lengths can be combined, and their effect is the same as a lens with one-half the focal length, while the spherical aberration is greatly diminished. The books of reference mentioned under ABERRATION, CHROMATIC, will also supply ample information on this subject.

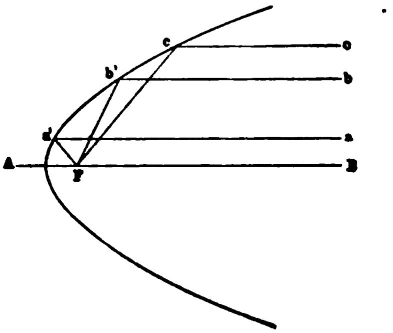


FIG. 2.

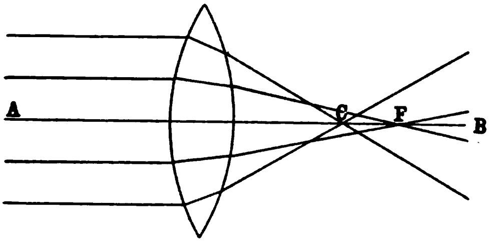


FIG. 3.

ABERRATION OF LIGHT. An expression used to describe the phenomena that arise from the fact that light requires appreciable time for its transmission through space. The motion of light traveling from a star or a planet toward the earth, combined with the earth's own motion, causes an apparent displacement of the stars on the sky: they all appear to occupy positions a little different from their true ones. In explaining this phenomenon, we often use the analogy of a man running in a rain-storm. Though the raindrops may be falling straight down, they will seem to the running man to descend on his face slantingly. Light, too, may be coming down, as it were, vertically, but as the earth, with the observer on it, is hurrying through space, there will be produced a similar apparent slant of the light, and we shall see the stars displaced on the sky in the direction of the terrestrial motion. But since the motion of our planet takes place in a closed, oval curve, the apparent displacement of the stars is now in one direction, and now in another, corresponding to the earth's position in one or the other half of its oval path. The result is that the stars themselves seem to move each year through a small curve; and this is a sort of miniature reproduction of the earth's orbit around the sun. When the celestial body under observation is itself in motion with respect to our earth, as is the case with the other planets of the solar system, a further somewhat analogous displacement is produced. Astronomers therefore need to correct all their observations by a process of calculation, so as to reduce them to what they would be if no such thing as aberration existed. Aberration was discovered by James Bradley, and was announced to the Royal Society of England in 1729.

THE CONSTANT OF ABERRATION. From what has been said above it may be seen that the quantity of apparent displacement depends on the velocities both of light and of the earth. The nature of that dependence is quite simple: the velocity of light is known in miles per second from laboratory experiments; the amount of possible aberration, while inversely proportional to the velocity of light, is large in proportion to the earth's speed. If, therefore, we could determine by direct observation of the stars just how much they are displaced, it would be possible to calculate the earth's orbital velocity from the size of the aberration. The aberration may be determined by the simple method of observing a star at intervals during the year and noting how much its position changes. If we select a star most favorably situated for this purpose, we find that its position throughout the year will vary from the average by a little more than twenty circular seconds. This number (more exactly 20″.47) is called the constant of aberration. To measure this constant with the utmost possible precision has long been the object of very earnest efforts; and few other astronomical problems have received so much attention in recent years. Its particular importance, as we have seen, is due to the computations rendered possible by a knowledge of the constant. Combined with the known velocity of light, it gives us the earth's orbital velocity in miles per second. From this we get the length of the annual terrestrial orbit in miles, and then by a simple calculation we find its semi-diameter, or the distance from the earth to the sun. This last is the fundamental unit for astronomical measures of distance, and its exact evaluation is considered the most important of all astronomical problems. See PARALLAX, section *Solar Parallax;* SUN.

ABERSYCHAN. ăb′ēr-sĭk′*an*. A town in Monmouthshire, England, about 10 miles north of Newport, in the coal district (Map: England, C 5). There are numerous collieries and iron foundries. Pop., 1891, 15,300; 1901, 17,800.

AB′ERT, John James (1788-1863). An American military engineer. He was born in Shepherdstown, Virginia, and graduated at West Point in 1811, but resigned from the army and practiced law in Washington. He served as a private in the battle of Bladensburg, August 24, 1814. Later in the same year he joined the corps of engineers, and in 1838 had become colonel in command of the topographical bureau. He was retired in 1861. Colonel Abert exercised an important influence in the development of the earlier engineering works of the Government.

AB′ERTIL′LERY. A town in Monmouthshire, England, four and one-half miles northwest of Pontypool. Population, chiefly engaged in coal-mining, 1891, 10,850; 1901, 22,000.

ABERYSTWITH, ăb′ẽr-ĭst′wĭth. A favorite watering-place and summer resort in Cardiganshire, Wales, on Cardigan Bay, about 50 miles north-northeast of Swansea (Map: Wales, B 4). On a hill above the town stand the ruins of an old castle erected by Gilbert de Strongbow. Adjoining it is the University College of Wales, established in 1872. Pop., in 1891, 6700; 1901, 8000.

ABERYSTWITH, University College of. See Wales, University of.

ABES′SA. A damsel in Spenser's *Faerie Queene* (I. iii.), who personified abbeys and convents. When Una, in search of the Red Cross Knight, called out to her, Abessa, frightened at the lion, ran into the house of Blind Superstition and closed the door, which the lion broke open. The meaning is, that when Truth came, the abbeys and convents were alarmed and barred her out, but Henry VIII. (the lion) broke in the door.

ABEY′ANCE (O. F. *abeiance*, from *a*, Lat. *ad*, at + O. F. *beer*, Fr. *bayer*, Middle Lat. *badare*, to gape, to expect). A legal term importing that the title to real or personal property, a dignity or office is not vested in any one, but is in expectation or suspended until the true owner appears or the right thereto is determined. Strictly speaking, there could be no abeyance of a freehold at common law. In legal contemplation, there must always be some one in whom a present estate or interest in the land is vested. This, however, did not apply to future estates which might be in abeyance. Thus, when one holds land for life, with remainder to the heir of a living person other than himself, the remainder is in abeyance, since the heirs of that other remain undetermined while he is alive. Titles of power are said to be in abeyance when it is uncertain who shall enjoy them. Thus, under the English law, when a nobleman leaving a title descendible to his heirs general dies, leaving daughters and no male issue, the king, by his prerogative, may grant the title to any one of the daughters. Until the king exercises his prerogative, the title, which is thus suspended, is said to be in abeyance. See the authorities referred to under the article on Property.

AB′GAR. A common name or title of several kings of Edessa in northwestern Mesopotamia. One of them is known from an alleged correspondence with Christ. The account given by Eusebius (*Ecclesiastical History*, xiii., i.) states that he sent a letter to Christ requesting him to come to Mesopotamia and heal him. To this Christ made a reply that although unable himself to come, he would, after his ascension, send a disciple. Both of these letters Eusebius claims to have found in the archives of Edessa and believes to be genuine. Other versions add that Christ sent to the king a portrait, now displayed at both Rome and Genoa. Consult: R. A. Lipsius, *Die Edessenische Abgar Sage* (Brunswick, 1880).

ABHOR′RERS. In English history, the name given to the Tory element that expressed abhorrence of the petitions presented to Charles II. for the reassembling of Parliament (1680), and that upheld the King in his efforts to control public opinion. Their opponents were called Petitioners. Consult: *A List of Abhorrers, etc.* (London, 1682), A. A. Cooper, First Earl of Shaftesbury, *About Abhorrers and Addressers* (London, 1682).

ABI′ATHAR (Heb. father of plenty). The high priest whose father, Ahimelech (I. Samuel xxii : 20), was slain at the command of Saul for having received and helped the fugitive David (I. Samuel xxii : 9-10). The statement (II. Samuel viii : 17; also I. Chronicles xviii : 16, where for Ahimelech we must read Abimelech) that Ahimelech was the son of Abiathar must be inverted in accordance with I. Samuel xxii : 20. Abiathar also was a strong adherent of David, and showed his friendship especially during Absalom's rebellion (II. Samuel xv : 29). Later on, Abiathar favored Adonijah (I. Chronicles i : 7), and for this Solomon deprived him of his priesthood and banished him to Anathoth (I. Kings ii : 26-33). With his deposition, the direct high priest by line of Eleazar comes to an end, and the place is taken by Zadok and his descendants (I. Kings ii : 35. See Ezekiel xl : 46; xliii : 19; xliv : 15). See Ahimelech.

A′BIB. The older biblical name for the first month of the Jewish ecclesiastical, and the seventh of the civil, year. In this month the feast of Passover is celebrated (Exodus xiii : 4; xxxiv : 18). In the later books of the Bible representing the period when the Babylonian names, together with the Babylonian calendar, were adopted by the Hebrews (Nehemiah ii : 1; Esther iii : 7), the month is called Nisan, and this name is used at the present time in the official calendar of the Jewish Church.

ABICH, ä′bĭk, Wilhelm Hermann (1806-86). A German geologist and traveler. He was born in Berlin. He studied at the university there, in 1842 became professor of mineralogy in Dorpat, and in 1853 member of the St. Petersburg Academy of Sciences. He explored the Caucasus, Russian Armenia, northern Persia and Daghestan, and published several books on the geology and mineralogy of those regions, among which may be mentioned: *Ueber die Natronseen auf der Araxesebene* (1846 and 1849); *Sur la structure et la géologie du Daghestan* (1862).

ABIES, ā′bĭ-ēz. See Fir.

AB′IGAIL (Heb., my father is joy, or father of joy). The wife of King David, famed for her beauty and discretion. Abigail was originally the wife of Nabal, and gave food to David during his flight from Saul, after her husband had refused to do so. "About ten days later" Nabal died, and David took Abigail to wife (I. Samuel xxv : 2-42). The Amalekites captured Abigail during a raid (I. Kings xxx : 5), but David recovered her (I. Samuel xxx : 18), and she bore him a son, Chileab (II. Samuel iii : 3), or Daniel (I. Chronicles iii : 1). Another Abigail was a sister of David, and became the mother of Amasa (II. Samuel xvii : 25). In modern usage Abigail is employed as a general name for a waiting-maid or a lady's-maid.

ABI'JAH (Heb., Yahweh is father), or **ABI'JAM.** The name of several Bible characters.

1. King of Judah, a son of Rehoboam and Maacah, the daughter of Abishalom (I. Kings xv : 2). He succeeded his father and reigned about three years (936-934? B.C.), during which time there was war between him and Jeroboam I. (I. Kings xv : 7). Abijah probably gained a victory over Jeroboam near Zemaraim (II. Chronicles xiii), but the number of combatants, 1,200,000, is greatly exaggerated.

2. A son of Jeroboam I. of Israel (937-915? B.C.), who died in his childhood (I. Kings xiv: 1-18). The Greek version brings in the story of his illness and his mother's visit to the prophet Ahijah immediately after the death of Solomon, consequently before Jeroboam ascended the throne.

ABILDGAARD, ä'bĭld-gârd, NIKOLAI ABRAHAM (1743-1809). A Danish historical painter. He was born at Copenhagen, and first studied at the Academy there. He went to Rome in 1772, was appointed a professor in 1777 and in 1789 a director of the Academy. His most important work, a series of ten pictures in the castle of Christiansborg, was burned with the castle in 1794. He also painted scenes from Shakespeare and Ossian, and four from the *Andria* of Terence. He was one of Thorwaldsen's early instructors.

AB'ILE'NE. A district referred to in Luke iii : 1 ("Lysanias being tetrarch of Abilene"). It was a fragment of the earlier kingdom of Iturea, the capital of which was Chalcis in the plain of Massyas, between the Lebanon and Anti-Lebanon mountains. When the Romans took possession of this region the Iturean kingdom became broken up into four tetrarchies, of which Abilene was one. This took place, probably, between 36 and 23 B.C. The Lysanias referred to by Luke was the second of that name, the first Lysanias having been ruler of the still undivided territory. The district of Abilene was so named from its chief town, Abila, on the Abana or Barada, the stream on which Damascus is situated. Abila was on the eastern slope of the Anti-Lebanon range, just where the Abana breaks through the mountains. Near its site are an old cemetery and the ruins of a small temple, both belonging to Roman times. In 37 A.D., Caligula gave Abilene to Agrippa I., who died in 44. In 53 it was given by Claudius to Agrippa II. (mentioned in Acts xxv), who ruled it until his death in 100, when it became a part of the Roman province of Syria. Consult Schürer, *History of the Jewish People,* I. ii. 325-344.

ABILENE, ăb'ĭ-lēn. A city and county seat of Dickinson Co., Kan., 163 miles west of Kansas City, on the Union Pacific, the Chicago, Rock Island, and Pacific, and the Atchison, Topeka, and Santa Fe railroads, and on the Smoky Hill River (Map: Kansas, E. 3). It is primarily a residential and commercial place, contains Mount Saint Joseph Academy; manufactures merry-go-rounds, creamery products, etc. The water supply is obtained from Sand Springs, four miles distant. Settled about 1860, Abilene was incorporated in 1869, the charter of that date being still in operation, and providing for an annually elected mayor and a municipal council. Pop., 1890, 3547; 1900, 3507; 1905, 4016.

ABILENE. A city and county seat of Taylor Co., Tex., 160 miles west by south of Fort Worth, on the Texas and Pacific Railroad (Map: Texas, E 3). It has a State Epileptic Colony. The industrial establishments include flour, grist, and planing mills, cotton-gins, a cotton oil mill, a cotton compress, etc. Pop., 1890, 3194; 1900, 3411.

ABIMELECH, ȧ-bĭm'ĕ-lĕk (Heb. my father is king, or Moloch). The name of four persons in the Old Testament, two of whom appear prominently in the narratives.

1. A son of Gideon (Judges viii : 31), c.1200 B.C., and reckoned as one of the judges by the narrative in Judges x:1. Upon the death of his father, who refused to take the title of king either for himself or children, Abimelech set out to claim the sovereignty, slew seventy of his brothers, and was declared king (Judges ix : 1-6). Three years afterward the Shechemites under the leadership of Gaal made an unsuccessful attempt to throw off his rule (Judges xxii : 41). After capturing Shechem and burning the temple of El-berith, Abimelech went against Thebez, and here, while besieging the place, he was struck on the head by a piece of millstone thrown from the wall by a woman. To avoid an ignominious death, he ordered his armor-bearer to run him through (Judges ib. 43-57). His reign is the first attempt to establish a monarchy in Israel.

2. A king of Gerar mentioned both in the biblical narrative about Abraham (Genesis xx and xxi : 22-32), and about Isaac (Genesis xxvi : 7-11; 26-33). The story in both cases is pretty much alike. Abimelech takes Sarah into his harem, after Abraham, for fear that he should be killed, declared Sarah to be his sister. In a dream, the true relation between Abraham and Sarah is revealed to Abimelech, who forthwith returns Sarah to her husband and loads the latter with presents of cattle and servants. Similarly Isaac declares to the men of Gerar, among whom he has settled, that Rebekah is his sister. Abimelech, however, discovers the true relationship, and reproaches Isaac for having almost been the cause of bringing a "great sin" upon Abimelech and the men of Gerar. In view of this similarity, it is generally supposed by modern critics that the two stories are but different versions of one and the same tale.

3. A king of Gath, according to the title of Psalm xxxiv, though here it is possible that Abimelech has by an error been introduced for Achish (I. Samuel xxi : 20).

4. A priest according to I. Chronicles xviii : 16, where, however, the reading must be corrected to Ahimelech, as we find the name written in II. Samuel viii : 17 and elsewhere in Samuel. See AHIMELECH.

AB'INGDON. A city in Knox County, Ill., 10 miles from Galesburg, and 85 miles northeast of Quincy, on the line of the Chicago, Burlington and Quincy and the Iowa Central railroads (Map: Illinois, B 3). It is the seat of Hedding College, a Methodist Episcopal institution, opened in 1853. Abingdon has wagon works, an animal-trap factory, said to be the largest in the world, and other manufactures of less extent. The city was first settled in 1828, and was incorporated in 1857. It is governed by the charter of 1859. The mayor's term is one year, and the city council is composed of five members. Pop., 1890, 1321; 1900, 2022.

ABINGDON. A town and county seat of Washington County, Va., 189 miles west by south of Lynchburg, on the Norfolk and Western Railroad (Map: Virginia, C 5). It is the seat of Martha Washington College (Methodist Episcopal, South), established in 1858, Stonewall Jackson Institute (Presbyterian), opened in 1869 (both for young ladies), and Abingdon Academy. There are canning, brick, cigar, and wagon factories, and flour, lumber, and planing mills. Abingdon was settled about 1730 and was incorporated in 1778. Pop., 1905 (est.), 2500.

AB′INGTON. A manufacturing town in Plymouth Co., Mass., 20 miles southeast of Boston, on the New York, New Haven and Hartford Railroad (Map: Massachusetts, F 3). It was settled about 1680, and incorporated as a colonial town 1712. The town's affairs are administered by the town meetings, at which all questions affecting the interests of the town are discussed and settled. The town owns and operates its water-works. Pop., 1890, 4260; 1900, 4489; 1905, 5081. Consult: B. Hobart, *History of the Town of Abington* (Boston, 1866).

ABINGTON, FRANCES (1737-1815). A famous English actress. She was the daughter of Barton, a common soldier. As an errand-girl, she acquired French from a milliner. She became a flower-girl at the theatres, and made her first appearance at the Haymarket in London (1775) as Miranda, in *The Busybody.* She was married to Abington, her music teacher, from whom she soon separated. The headdress she wore was adopted by the women of fashion, and the "Abington cap" became famous. Returning to England in 1765, at the invitation of Garrick, she played at Drury Lane for eighteen years, and later at Covent Garden. She was the original representative of Lady Teazle in 1777, and played many Shakespearean parts. After the retirement of Mrs. Pritchard and Kitty Clive, she had no rivals on the London stage, and became the first comic actress of the period. Her last appearance was on April 12, 1799.

AB′IOGEN′ESIS. See BIOGENESIS.

ABIPONE, ä′bê-pō′nȧ. A South American Indian tribe of Guaycuran stock, which formerly wandered over the Gran Chaco region, west of the Paraguay River, from the headwaters of the Rio Grande in Bolivia southward to the Vermejo in Argentina. Their traditions pointed to a more northern origin. They obtained horses about the year 1640, and soon developed into bold riders and implacable foes of the Spaniards. They were of splendid physique, and lived entirely by hunting. The women tattooed, and the men practiced the couvade. Their weapons were the bow, the lance, and the shield. The Jesuits established missions among them, but owing to constant wars with the Spaniards and with other tribes, and also to the custom among the women of killing all but two children born to a family, the tribe, which about 1780 was estimated at 5000, dwindled rapidly and is now supposed to be entirely extinct.

ABKHASIA, ȧb-KHä′sê-ȧ. A district of Asiatic Russia on the Black Sea, included in the government of Kutais. It is separated by the lofty ridge of the Caucasus from Circassia, and is bounded on the southeast by Mingrelia (Map: Russia, F 6). It derives its name from the Abkhasians. The country is mountainous, with well-watered valleys, and has rich woods of oak, walnut trees, etc. Area, about 2800 square miles. The northern part has a mild and healthful climate, while in the south it is hot and unhealthful. Its population, numbering about 50,000, mainly Mingrelians and Abkhasians, is engaged in agriculture, cattle-raising, and trade in lumber. This country was subdued by the Emperor Justinian, who introduced the Christian religion. Subsequently Persia, Georgia, and Turkey ruled in succession, the latter suppressing Christianity and establishing Moslemism. The Russians began to establish themselves after the Treaty of Adrianople in 1829, but the conquest was not completed till 1864. The chief town in this region is Sukhumkale. The people speak a Circassian dialect, and are physically akin to that stock, although typically ruder and less graceful. Their folk-life is also more primitive. As a result of the Russian occupation, a great part of the tribe emigrated into Turkish territory. See CIRCASSIANS.

AB′LATIVE CASE. See DECLENSION.

ABLAUT, ăb′lout; Ger. pron. äp′lout, or VOWEL GRADATION. The name given by German scholars, and in common use in English, to a change in the root vowel in different forms of the same word. It appears throughout the Indo-Germanic languages, and is frequent in nouns, although it is most obvious in the so-called "strong verbs" of the Germanic group (e.g., *sing, sang, sung*). It is divided into quantitative (varying between vowels of different length) and qualitative (as between *e* and *o*). Both forms depend originally on accent, as Sanskrit *sétu*, 'binding,' but *sitá*, 'bound,' or Greek πατήρ 'father,' but εὐπάτωρ, "of noble descent." The full application of ablaut has conclusively shown the existence of dissyllabic and even trisyllabic roots in Indo-Germanic. Consult: Hirt, *Der indogermanische Ablaut* (Strassburg, 1900); Wood, *Indo-European ax; aix; aux* (ib., 1905). See PHONETIC LAWS.

AB′LEGATE (Lat. *ab*, away, from, off + *legare*, to send with a commission). A papal envoy or emissary, a special commissioner, deputed by the papal court at Rome to carry the hat and red biretta to a newly appointed cardinal. His official duties are completed when the latter has received the insignia of his office. The so-called *apostolic* ablegates are of higher rank than those termed *pontifical.*

ABLU′TION. See PURIFICATION.

ABNAKI, ȧb-nä′kê ("Easterners"). A confederacy of Algonquian tribes, including the Passamaquoddies, Penobscots, Norridgewocks, and others, formerly occupying what is now Maine and southern New Brunswick. On the northeast their territory adjoined that of the Micmacs, while on the southwest it merged into that of the Pennacooks. In consequence of King Philip's War (see WAMPANOAG), they attached themselves to the French side and maintained unceasing hostility against the encroachment of the English, until the destruction of their principal town at Norridgewock and the killing of their missionary Rasle in 1724, after which the greater portion removed to Saint Francis, Canada, whither other refugees from the New England tribes had already preceded them. Those who remained afterward entered into an arrangement with the English by which they were confirmed in possession of a small part of their ancient inheritance. They are now represented by the Amalecites on Saint John River, New Brunswick and Quebec (820), the Passamaquoddies on the bay of that name in Maine (300), the Penobscots at Oldtown, Maine (400), and the Abnakis at Saint Francis and Bécancour, Quebec (430). Their language is preserved in the monumental dictionary of Rasle.

AB'NER (Heb. father of light). The son of Ner, and cousin of Saul, and commander of his army (I. Samuel xiv : 50). After Saul's death the tribe of Judah recognized David, while Abner prevailed upon the other tribes to recognize Saul's son, Ishbosheth (II. Samuel ii:8-11). David sent his army, under Joab, into the field, and at the pool of Gibeon the followers of Abner, who was in control, suffered defeat (*ibid.*, verses 12-17). In his flight, Abner, being hotly pursued by Asahel, turned and reluctantly slew him (*ibid.*, verses 19-23). Afterward Abner had a quarrel with Ishbosheth and went over to David (II. Samuel iii : 7-11, 17-21); but the death of Asahel produced a blood feud between Joab (Asahel's brother) and Abner, which ultimately led to Abner's death. In consequence of a quarrel between Abner and his master, Ishbosheth, who accused him of having designs upon the throne, Abner espoused David's cause. While being hospitably entertained by David at Hebron, Abner was treacherously killed by Joab with the connivance of his brother Abishai (II. Samuel iii : 22-27). The murder called forth general indignation, and the King himself acted as chief mourner. He ordered a public mourning, and a portion of an elegy is preserved (II. Samuel iii : 33-34), said to have been composed by David in memory of Abner.

AB'NEY, Sir WILLIAM DE WIVELESLIE (1844—). An English astronomer and physicist. He was born at Derby, educated at the royal Military Academy, Woolwich, became a lieutenant in the Royal Engineers in 1861 and a captain in 1871. He was president of the Royal Astronomical Society, 1893-95, and president of the Physical Society of London, 1895-97. He became adviser to the Science and Art Department of the Board of Education in 1903, having been principal assistant secretary since 1899. In the same year he became a member of the Advisory Council for Education to the War Office. He is well known for his researches in photography and spectroscopy, and has published a number of important books on these subjects, including *Instruction in Photography* (1870); *Treatise on Photography* (1875); *Colour Vision, Colour Measurement and Mixture* (1893); *The Pioneers of the Alps*, with C. D. Cunningham (1888). He was knighted in 1900.

ABNORMAL PSYCHOLOGY. See MENTAL PATHOLOGY; PSYCHOLOGY.

ÅBO, ạ'bô. The most ancient city and former capital of Finland, now the chief town of the Russian Government of Åbo-Björneborg, situated on the River Aurayoki, near its embouchure in the Gulf of Bothnia, 128 miles west by north from Helsingfors (Map: Russia, B 2). Its streets are broad and lined with rather low stone buildings. Owing to its antiquity, Åbo has a number of buildings of historical interest, among them the cathedral, containing a magnificent sarcophagus erected in 1865 for the unfortunate Queen, Catharine Monsdotter, who died in 1512. In one of its suburbs is the spring of St. Henry, in which, according to tradition, the first Finns embracing Christianity were baptized. It is in regular steamship communication with St. Petersburg, Stockholm, and other ports on the Baltic, visited annually by some 700 vessels, whose aggregate tonnage reaches about 200,000 tons. Shipbuilding is an important industry here, many of the Russian warships having been constructed in this city. The great Crayton works supply the Russian fleet with torpedo boats. It has a number of cotton mills, tobacco factories, sugar refineries, and machine shops. Of its educational institutions, the School of Navigation and the School for Deaf-mutes deserve special attention. In addition to these it has a number of gymnasiums, a technical institute, a commercial school, and a normal training school. The United States is represented by a consular agent. Population, 1897, 34,964; 1904, 42,639, 54% being Finns and nearly 42% Swedes. The town grew up around a castle (which is still in existence, and is used as a prison at present) founded in 1156 by Eric IX., and became an important place in the following century. It was repeatedly attacked and destroyed by the Russians in their many wars with the Swedes, and finally fell into their hands in 1808; since then it has remained a Russian possession. It was the capital of Finland until 1819. In the year 1827 a great part of the town, including the university buildings, was destroyed by fire, and the university was removed to Helsingfors, now the capital. The Peace of Åbo (1743), between Sweden and Russia, gave Russia control of the southern part of Finland as far as the Kymen River and put an end to the war commenced by Sweden, under French instigation, in 1741.

ÅBO-BJÖRNEBORG, ạ'bô-byẽr'n*e*-bôrg. A government in southwest Finland. Area, 9336 square miles. Its topography is like that of the rest of Finland. Among the mountain ranges of granite crossing it there are about one hundred and fifty lakes and numerous marshes. The southern section is more hilly than the northern, and along the seashore has many safe havens for sea-going vessels. Except the River Kumo, Åbo-Björneborg has no navigable rivers. It has a temperate and healthful climate, and the principal industries are agriculture and the raising of cattle, and fishing. There is a flourishing mining industry, the chief products being granite, black marble, iron, and clay. Åbo-Björneborg is, moreover, the foremost manufacturing province of Finland, the chief branches of industry being wood and metal working, distilling, brewing, manufacture of leather, paper, and tobacco. Population, 1904, 470,077, of whom about one-seventh lived in towns and villages; in 1897 there were 425,026 people. About 83% of the population are Finns, less than 17% Swedes.

AB'OLI'TIONISTS (Lat. *abolitio*, an annulling, from *abolere*, to check the growth). The term used in the United States, after 1835 and until the Civil War, for those opponents of slavery who were the most intense in their desire to secure the immediate emancipation of the blacks. Others avowed their "anti-slavery" opinions, but these advocated, by all the means they could command, immediate "abolition." Their position was weakened, and their reputation for sobriety was damaged, by their steadfast refusal to recognize the binding force of any human laws which recognized human slavery, and even of the constitution; and their extreme demands and radical methods repelled the sympathy of many conservative men who desired that the abolition of slavery should be secured, although by expedient and legal means. Although discredited in many quarters, the abolitionists were in the end successful, from one point of view, in making slavery a national issue and in hastening the time of final decision as to its continuance. Among the most conspicuous leaders of the abolitionists were William Lloyd Garrison, a vigorous and fearless writer, Wendell Phillips, Gerrit Smith, a generous philanthropist, Arthur Tappan, William Goodell, and Lucretia Mott. The lives of most of these leaders have been written. Consult: Garrison, *William Lloyd Garrison* (New York, 1885-89) and Hume, *The Abolitionists* (New York, 1905). See the articles ANTI-SLAVERY SOCIETY; GARRISON, WILLIAM LLOYD; GIDDINGS, JOSHUA R.; and PARKER, THEODORE.

ABOLITION OF SLAV'ERY. See SLAVERY.

ABO'MA (Portug.). A boa. The term is widespread in tropical America, but lately has been more especially applied to the Central American thick-headed or singed boa (*Epicrates cenchria*), which is of gigantic size, and is dark yellowish-gray, having a row of dark brown rings along the back, and the sides marked with dark blotches, each inclosing a lighter crescent. See BOA and Plate of BOAS.

ABOMEY, ä'bô-mā'. The capital of the former Kingdom of Dahomey, West Africa, situated about 60 miles inland, in 7° N. lat. and 2° 4′ E. long. (Map: Africa, E 4). It is surrounded by a wall built of mud and a deep trench. The houses, also built of mud, are unpretentious in appearance. There are several royal palaces, once the scenes of religious rites and barbaric orgies. Before the French occupation Abomey was an important slave market, but at present the traffic is confined to ivory, palm oil, and gold. The town was captured by the French in 1892. The population is estimated at about 15,000.

ABORIGINES, ăb'ô-rĭj'ĭ-nēz (Lat. *ab*, from + *origo*, origin). Properly, the earliest inhabitants of a country. The corresponding term used by the Greeks was *autochthones* (q.v.). The Roman and Greek historians, however, apply the name to a special people, who, according to tradition, had their original seats in the mountains about Reate, now Rieti; but, being driven out by the Sabines, descended into Latium, and, in conjunction with a tribe of Pelasgi, subdued or expelled the Siculi and occupied the country. The aborigines then disappeared as a distinct people, they and their allies, the Pelasgi, having taken the name of Latini. The non-Pelasgic element of the Roman population is supposed to represent these aborigines, who would thus belong to the Oscans or Ausonians.

ABOR'TION (Lat. *abortio*, from *ab*, away + *oriri*, to rise). The expulsion of the offspring from the womb of its mother before it is capable of living independently. Abortion occurring in a woman before the sixth month of pregnancy is generally called a miscarriage. If the fœtus leaves the womb after it is viable, and before the proper end of pregnancy, the occurrence is termed a premature delivery. Hegar considers that there is, in women, one abortion to every ten normal pregnancies; Devilliers states the ratio as one in three or four. Whitehead states that 80% of all abortions take place between the second and fourth months of pregnancy. It is therefore important that a mother should have special care during the early months of gestation. Microscopical examination is required to determine the fact of an abortion occurring within four weeks of conception. After the first month the fœtus commences to assume a recognizable shape.

CAUSES OF ABORTION. Abortion may be due to disease of the father, to morbid changes in the ovum, to morbid changes in the placenta, or to maternal causes. (1) Of the diseases of the father that may cause abortion, syphilis is the most important. Habitual abortion leads to the suspicion of syphilitic taint, although other causes may bring about this condition. Old age, tuberculosis, or kidney disease of the father may so affect the vitality of the germ at conception that, although pregnancy may occur, there is not enough strength to complete the development. (2) Causes due to disease or death of the ovum itself, apart from other causes, are rare. They are usually associated with some defect in the formation of the young embryo. (3) Placental causes are frequent. If the placenta does not have a sufficient area from which to draw a blood supply for the fœtus, the latter may die; or if the placenta is fastened low in the uterus, hemorrhage and abortion are very liable to occur. (4) The causes which are due to disease or injury of the mother are the most frequent. Diseases of the decidua of the uterus and of the other generative organs, such as tumor of the ovary, distention of the Fallopian tubes, inflammatory adhesions about the uterus, and badly formed pelvic organs, are among the local causes. Certain constitutional diseases may also cause abortion, as syphilis. Alcoholic excesses are almost as pernicious. Poisoning with metals, as lead or mercury, with phosphorus and other poisons, as coal gas and many volatile oils, and some of the acute diseases, pneumonia, yellow fever, smallpox, and peritonitis, have brought about abortion. Shock and injury are very important causes. Excessive muscular fatigue, bicycle riding, horseback riding, lawn tennis, use of the sewing-machine, and swimming are especially to be avoided. Lack of hygiene is also responsible for numerous cases. Insufficient food, contaminated air, change in climate, and tightly laced corsets, all interfere with the proper nourishment of the fœtus and thus induce abortion. After abortion has once taken place, others are very likely to occur, even in comparatively healthy women. A normal healthy mental attitude is a saving grace from this accident.

SYMPTOMS. The cardinal symptoms are pain and hemorrhage from the uterus, these varying greatly, according to the completeness of the process. Early symptoms may be a sensation of weight, with distress or slight pain in the back, increased by standing or walking, followed by oozing or a menstrual flow, or a sudden large hemorrhage. This may occur intermittently, sometimes lasting several days, with small discharges of blood, with pain, and then a cessation of all the symptoms for a few hours or more. In later abortions, the *liquor amnii*, in which the fœtus is suspended, may either ooze away or come away in a gush.

The pain is rarely continuous; at times it resembles the intermittent pains of a colicky diarrhœa. It is caused by the contraction of the uterine muscle trying to eject a foreign body. With each muscular contraction there is oozing, or more copious bleeding, or the expulsion of the product of conception. If the pains are comparatively weak and occur at long intervals, it may be possible to prevent the abortion. If they are strong and come closely one after the other, the chances of stopping the process are less.

TREATMENT. Healthy physical and mental exercise is one of the best preventives of this accident. In families where the mother or grandmother aborted frequently, special care of diet, exercise, and clothing should be taken. Constipation should be avoided by the use of water and the green vegetables. Should the symptoms mentioned occur, the woman should lie down, absolutely quiet, on her back and call her regular medical attendant.

There are occasional cases (as where the outlet of the pelvis is very contracted) in which it is necessary for physicians to induce abortion. It cannot be too generally known that all attempts at procuring criminal abortion, either by the administration of powerful drugs or the application of instruments, are accompanied with extreme danger to the pregnant woman. It cannot be too earnestly impressed upon the mind of those who are tempted to procure a criminal abortion by means of drugs that the danger of causing death is very serious. Many so-called emmenagogues (q.v.), which induce the menstrual flow in a woman who is not pregnant, but is merely suffering from amenorrhœa, or suppression of the menses, are abortifacients only when given in such doses as to endanger life, or to set up violent internal inflammations. Among these are the various preparations of ergot of rye (q.v.), savin (the most powerful of all emmenagogues), borax, rue, tansy, cantharides, etc. In the South, among the ignorant negroes, concoctions of pennyroyal and cotton-root bark are used for the same purpose. The milder emmenagogues, such as iron, aloes, etc., have no abortive tendency, except in the case of those women who are predisposed to abort. Violent purgatives, in cases where they have caused abortion, have not done so because they directly exercise an ecbolic effect on the uterus, but only as a secondary consequence of the excessive intestinal irritation which they cause.

ABORTION, or MISCARRIAGE, IN LAW. The courts in this country are not agreed as to the nature of the crime at common law. In a number of States there are decisions or dicta to the effect that "to produce an abortion on a woman, before she is quick with child, and with her consent," is not to commit the common-law crime of abortion. On the other hand, it has been judicially declared in Pennsylvania that "it is not the murder of a living child which constitutes the offense of abortion, but the destruction of gestation by wicked means and against nature," and, consequently, that one who intentionally causes the miscarriage of a woman, even with her consent and before the fœtus has quickened, is indictable at common law. This appears to be the correct view, and it has been approved by several courts. Modern statutes, as a rule, have given effect to this view. At present the crime is generally defined, with much particularity, by statute, and may be committed by one of three classes of persons. First, by the pregnant woman who takes any drugs or submits to any treatment with intent to produce her miscarriage, unless that is necessary to save her life or the life of the child. Second, by a person prescribing, supplying or administering any substance to a woman, or treating her, with intent to cause her miscarriage, unless that is necessary to save her life or the life of the child. Under some statutes, such a person may be guilty of the offense, whether the woman is pregnant or not; the gist of his crime consisting in the intention with which his act was done. Third, by a person manufacturing, giving or selling an instrument or substance with intent that it may be unlawfully used in procuring the miscarriage of a woman. Acts done in procuring an abortion may subject the actor to punishment for another crime also, as assault (q.v.), or homicide (q.v.). Consult: Wharton, *Criminal Law* (Philadelphia, 1896); Clark and Marshall, *Treatise on the Law of Crimes* (St. Paul, 1905).

ABORTION IN ANIMALS. In general, two forms of abortion are recognized by veterinarians, the non-contagious and the contagious. There are a number of conditions which may produce non-contagious abortion. A general cachexia or anæmia may be among the predisposing causes of abortion; and among other conditions and causes which may lead to abortion mention should be made of acute diseases of the vital organs, contagious fevers, chronic diseases of the abdominal organs, diseases of the ovaries, kidneys, or bladder, diarrhœa, fatty degeneration of the heart; ingestion of large quantities of cold water, various forms of indigestion, especially those which are accompanied by the formation of gas in the stomach; imprudent feeding with succulent forage in large quantities, such as roots, potatoes, apples, pumpkins, ergotized grasses, sweaty or rusty grains and grasses; standing in stalls with too great a backward slope, nervous excitement, and muscular strain. Contagious abortion is most frequent in cows. It occurs also in sheep, goats, horses, swine, and, perhaps, in the dog and cat. It appears in an enzoötic or epizoötic form. The disease is perpetuated in the herd or transmitted from one herd to another by means of contagion. If an aborting cow is placed in a herd which has hitherto been healthy, an outbreak of abortion may occur. Bulls that have served aborting cows may transmit the disease to other cows. In general, the micro-organisms to which the disease is due are found in the male and female genital organs, and on the afterbirth from aborting animals.

In cows, abortion seldom occurs before the fourth month of pregnancy, but may occur at any time after that period. The symptoms of the disease are not prominent or characteristic. Cows which are affected with the disease may remain apparently healthy until abortion takes place. The fœtus is expelled with ease, and is usually dead at birth. If abortion occurs at the end of six months the young may be alive, but lives only a few hours. Mares abort between the fourth and the seventh month of gestation. The premonitory symptoms of abortion in mares are enlargement of the mammary glands and a white mucous or sometimes purulent discharge from the vagina three or four days before the expulsion of the fœtus. The treatment for this disease, which has given satisfactory results, is the application of thorough antisepsis. In case of an outbreak of abortion, the fœtus and fœtal membranes from aborting animals should be burned or deeply buried, the posterior parts of the animals should be washed in some antiseptic solution, repeated antiseptic vaginal douches should be given, and the stable should be thoroughly disinfected. In order to prevent the possible spread of the infection, the posterior parts of other cows or mares in the same stable should be carefully washed with a solution of creolin, potassium permanganate, or corrosive sublimate. Contagious or epizoötic abortion has been known in all parts of Europe since the eighteenth century. The disease also prevails in Australia and in all parts of the United States. Many extensive outbreaks are recorded in different localities. Consult: Turner's "Infectious Abortion in Mares," *American Veterinarian Review* (1894); *Report United States Department of Agriculture*, 1893, Division of Animal Industry, Bulletin 3, D. E. Salmon; *Special Report on Miscellaneous Investigations Concerning Infectious and Parasitic Diseases of Domesticated Animals* (Washington, 1893).

ABORTION IN PLANTS. That kind of arrest in development by which an organ appears in its early stages, but fails to develop to its normal form or size. For example, in many flowers certain stamens are aborted, their primordia having appeared, but having failed to develop into functioning stamens. The abortion may be of any degree between the first appearance of the organ and its complete maturity. A very closely related term is "suppression," in which not even the beginning of an expected organ appears. The phenomenon is chiefly observable in connection with the flower (q.v.).

ABOU BEN ADHEM (ä'bōō bĕn äd'hĕm) **AND THE ANGEL.** A short narrative poem by Leigh Hunt, the significance of which appears in the line.

"Write me as one that loves his fellowmen."

ABOUKIR, ä'bōō-kēr'. See ABUKIR.

ABOULIA, ȧ-bōō'lĭ-ȧ. See under INSANITY.

ABOUT'. See TACKING.

ABOUT, ȧ'bōō', EDMOND (1828-85). A brilliant, witty, but uneven French journalist, novelist, and writer of social and political essays. He was born at Dieuze, completed his studies in Paris, won honors, and was sent in 1851 to the French School at Athens, where he studied little, but observed much in a desultory way. The literary result of his two years' stay in Greece is *La Grèce contemporaine* (1854), and *Le roi des montagnes* (1856), both full of humor and irony. They were popular, often translated, and had influence on what passed for political thought. In 1855 he published *Tolla*, a story of Italy, borrowed in part, and without due acknowledgment, from an Italian novel, *Vittoria Savorelli* (1841). In 1856 he essayed the stage without success, but won popularity by short stories collected under the titles *Les mariages de Paris* (1856) and *Les mariages de province* (1868). His most popular stories are *L'homme à l'oreille cassée* (1861) and *Le nez du notaire* (1861), both often translated. He had a gift of facile narration, but he did not take his talent seriously, and ceased writing fiction with the fall of the Second Empire, of which he was a spoiled child. To politics during these years he had contributed *La question romaine* (1859), *Rome contemporaine* (1861), *La Prusse en 1860*, *La nouvelle carte de l'Europe* (1860), and *Le progrès* (1864). After the fall of the Empire he became editor of *Le XIX. Siècle*, and published a bitter book on Alsace (1872). He was made an academician in 1884. The general characteristics of his work are a kindly humor, a keen irony, a cleanly taste, and a rather shallow skepticism.

ABOVILLE, ȧ'bô'vē'y' *or* ȧ'bô'vēl', FRANÇOIS MARIE (1730-1817). A French general of artillery. He was born at Brest. During the war of the American Revolution he commanded Rochambeau's artillery at Yorktown. In 1792 he commanded the armies of the North and of Ardennes, and in 1809 was appointed Governor of Brest.

ABOX'. See BOX HAULING.

A'BRA. (1) A character in Prior's poem *Solomon on the Vanity of the World.* She appears in the second part of the poem as an obedient concubine of the King, and finally captivates him. (2) A character in the mediæval romance of *Amadis of Greece.* She is a sister of the Sultan of Babylon, and secures his throne after he is killed by her lover, Lisnarte.

ABRABANEL, ȧ-brä'bȧ-nĕl', **ABARBANEL,** ȧ-bär'bȧ-nĕl', or **ABRAVANEL,** ȧ-brä'vȧ-nĕl', ISAAC BEN JEHUDA (1437-1508). A Jewish scholar and statesman. He was born in Lisbon, and claimed descent from King David. He was treasurer of Alfonso V., but after that king's death was banished from Portugal and his property confiscated. In Spain he made a fortune as a merchant, and was in high favor with Ferdinand and Isabella in 1487, but the decree of 1492 banished all Jews from Spain, and Abrabanel fled to Naples, where he found royal favor, but was again obliged to fly when Naples surrendered to the French in 1495. He settled last at Venice. He was one of the ablest men of his time, and was learned in biblical exegesis and philosophy. His most celebrated work is his *Herald of Salvation* (1526), an elaborate presentation of the Jewish doctrine of the Messiah.

AB'RACADAB'RA. A word probably derived from the same root as Abraxas, and used by the Gnostics of the sect of Basilides in the Orient (second century and later) as a magical formula by which the assistance of good spirits was invoked against all evils or maladies. Inscribed upon gems it formed a class of the so-called Abraxas stones, and was concealed about the person. With the spread of magical practices it came into use outside the Gnostic sect. The Gnostic physician Sammonicus describes how it can be made efficacious against fevers, especially agues. It should be written several times, each time on a separate line and each time dropping a letter, the letters arranged so as to form an inverted triangle and to read across the base and up the right side. This

ABRACADABRA
ABRACADABR
ABRACADAB
ABRACADA
ABRACAD
ABRACA
ABRAC
ABRA
ABR
AB
A

amulet was to be folded and worn on the bosom for nine days, then flung backward before sunrise into a stream flowing eastward. See ABRAXAS; AMULET.

AB'RADA'TAS. A king of Susa, who at first fought against Cyrus the Great, but who afterward, in consequence of the latter's kindness to Panthea, his wife, who had been captured by the Persians, yielded to Cyrus and became his ally. Abradatas perished in the war against Crœsus the Lydian. The story of his romantic affection for Panthea and her suicide after his death appears in the fifth book of Xenophon's *Cyropædia.*

A'BRAHAM. The Father of the Hebrews, whose story is given in Genesis xi-xxv. It consists of a series of incidents in the patriarch's life, put together in a consecutive narrative and emanating from different literary sources. In Genesis xi : 10 the genealogy of the Shemites (or sons of Shem) is taken up, leading up to Terah, the father of Abram, Nahor, and Haran. The home of Terah and his sons is Ur of the Chaldees—a place commonly identified with the site of the mound Mugheir, in southern Babylonia—but after the death of Haran the Terahites journey northward to Haran and take up their settlements at that place. Terah dies in Haran, and Abram, accompanied by his wife Sarai and his nephew Lot (the son of Haran), quits Babylonia by divine command and proceeds by a circuitous northern route via Damascus to Canaan. He halts at various places, notably Shechem and Bethel, where he erects altars to Yahweh (chap. xii.). Leading a pastoral life, we next find him in Egypt, whither he has been driven in consequence of a famine in Palestine. Sarai's beauty attracts the attention of the Pharaoh, and but for Yahweh's intervention Abram would have been obliged to give up his wife, whom he had represented to be his sister. Pharaoh obliges Abram to leave Egypt, and he accordingly returns to Bethel with Lot. At this juncture the separation between Abram and Lot takes place in consequence of quarrels between the followers of the two chiefs. Lot chooses for himself the rich pasture land of the Jordan Valley, while Abram remains in Canaan proper, though removing to Hebron. He becomes involved in a war with the kings of the Jordan Valley in order to rescue Lot, who had been taken captive. He not only succeeds in this enterprise, but aids in restoring the kings of Sodom and Gomorrah to power and magnanimously refuses any compensation for his services (chap. xiv). At the time that Abram left Haran he was seventy-five years old. At Damascus he is joined by Eliezer, who becomes his trusted servant, and on whom the succession to Abram's property would fall in the event of Abram remaining childless. This contingency is eliminated by the birth of Ishmael, a son by Hagar, a concubine of Abram, and an Egyptian maid-servant of Sarai. Subsequently, however, when Abram is ninety-nine years old and Sarai ninety, a son, who is called Isaac, is born to them (chap. xvii), and who becomes the heir of Abram in preference to Ishmael. At the time that this son is promised to Abram and Sarai, through the appearance of Yahweh himself to Abram, the names of the patriarch and his wife are changed by the Lord to Abraham and Sarah, respectively, the former being interpreted as embodying the promise that the patriarch will become "the father of a multitude of nations." The promise of a son to be born to Sarah is confirmed by a visit of Yahweh accompanied by two angels, all three in human form, who partake of Abraham's hospitality and make a similar announcement. The two angels proceed to Sodom and Gomorrah, while Yahweh remains behind and reveals to Abraham the intended destruction of the cities of the plain because of the wickedness and corruption prevailing there. Abraham pleads with Yahweh to save the cities for the sake of the righteous, and Yahweh agrees to do so provided only ten righteous men are found in the district. As a matter of fact, the cities are destroyed and only Lot and his family are permitted to escape (chap. xvii).

Before Isaac is actually born, Abraham is represented as proceeding to the extreme south of Palestine, known as the *Negeb*, and at Gerar encounters the King (Abimelech), who takes into his harem Sarah, whom Abraham again passes off as his sister, Jehovah warns Abimelech, and Sarah is released (chap. xx). The birth of Isaac is recounted in the 21st chapter. Eight days after his birth he is circumcised—an act which is regarded as symbolizing the covenant established between Jehovah and those descended from Abraham (Genesis xvii : 23-27). Some years later the faith of Abraham is put to a severe trial by the divine command to sacrifice his beloved son (chap. xxii). Abraham proceeds to carry out the decree, but is withheld from doing so by Jehovah himself, who, satisfied with the test, accepts a ram which providentially makes its appearance. The last three chapters of the narrative are taken up with the account of Sarah's death, her burial in the cave of Machpelah at Hebron, purchased by Abraham from Ephron the Hittite, the marriage of Isaac and Rebekah, and the death of Abraham, which, however, does not take place until his marriage to Keturah, by whom two sons are born to him. The death of Abraham takes place when he has reached the age of one hundred and seventy-five years, and he is interred by the side of Sarah at Machpelah.

Many modern Bible critics regard this cycle of Abrahamic stories as embodying a mixture of early and late traditions, a recast with a view of presenting Abraham as a type of the pious, observant Jew. Besides the biblical stories, other tales were current, or became current among the Jews of post-exile days, many of which were taken up into that portion of rabbinical literature known as the Midrash. In this way the biblical narrative was supplemented by incidents in the early career of Abraham, on which Genesis has nothing to say. These stories bring Abraham into association with Nimrod. The historical kernel in the Genesis chapters is quite insignificant. The genealogical lists are fictitious, the names representing in most cases not individuals but clans, of whom some faint traditions have survived. There is, however, no reason to doubt the existence of an ancient hero whose name was preserved in two forms, Abram and Abraham, the former representing perhaps a contraction or dialectical variation of the latter, and to whom as a popular personage various stories that had come down from various periods were attached. Of the "historical" Abram or Abraham hardly anything more can be asserted than that his home appears to have been Hebron. The wanderings of the Terahites, among whom Abram is reckoned, reflect the faint recollection of the origin of the Hebrews, or of some of the clans who subsequently formed part of the coalition known as Hebrews from the Mesopotamian district. The story of the wanderings of the Terahites along the Euphrates and thence into Palestine is typical of the manner in which nomadic bands in the early and the late days of Babylonian history proceeded from the Arabian desert, and, attracted by Babylonian culture, skirted the western borders of this culture, some making more or less permanent settlements, while others pass on to the north. A significant passage in Deuteronomy (xxvi : 5) designates the ancestors of the Hebrews as "nomadic Aramæans." Aram here is a designation for Mesopotamia, and the chief value of the story of Abraham's wanderings lies accordingly in thus preserving a picture of conditions prevailing at the earliest period of which any recollection survived among the people.

BIBLIOGRAPHY. For the rabbinical legends and traditions about Abraham, consult: Beer, *Das Leben Abrahams in Lebensgemälden biblischer Personen nach Auffassung der jüdischen Sage* (Leipzig, 1859); Grünbaum, *Neue Beiträge zur semitischen Sagenkunde* (Leipzig, 1893), which also contains the Mohammedan legends about Abraham. For archæological aspects, see Tomkins's *Studies on the Times of Abraham* (London, 1878); Sayce, *Patriarchal Palestine* (Utrecht, 1895) (to be used with caution), as well as the early chapters in histories of the Hebrews by Stade, Kittel, Guthe, Piepenbring, as well as the commentaries on Genesis by Gunkel, Dillmann, Delitzsch, etc.

ABRAHAM-A-SANCTA-CLARA, ä′brȧ-hăm ȧ säŋk′tȧ klär′ȧ (1644-1709). A popular German preacher and friar. His real name was Ulrich Megerle, but he is generally known by the name given to him when he joined the Augustinians. He was provincial prior of the Augustinians and court preacher at Vienna. Uncouth puns, coarse expressions, and strange freaks of humor marked his sermons. He lashed the follies of all classes of society and in particular exposed the vices of courtiers and court life. He was an honest, faithful, and devoted priest, as was proved by his self-sacrificing conduct during the plague in 1679. His collected works aggregate twenty-one volumes (1835).

ABRAHAMITES, ā′brȧ-hăm-īts, or **BOHEMIAN DEISTS**. The name under which a number of Bohemians, trusting to the edict of toleration issued by Joseph II., avowed themselves (1782) as believers of the doctrine alleged to have been held by Abraham before his circumcision. As early as the ninth century a sect of the same name had arisen in Syria, and had denied the divinity of Christ. But the Bohemian deists professed to be followers of John Huss, though they held no Christian doctrine beyond that of the unity of God, and accepted nothing of the Bible save the Ten Commandments and the Lord's Prayer. As they would join neither Jewish nor Christian sects, the Emperor refused to tolerate them, and in 1783 expelled them from their native land, and scattered them in various parts of Hungary, Transylvania, and Slavonia, where many were made converts to the Roman Catholic Church, while others died clinging to their simple creed.

A′BRAHAM-MEN′. A class of sturdy beggars in England who feigned lunacy, and wandered about the country in a disorderly manner. They were common in Shakespeare's time, and, it would seem, existed even as late as the period of the Civil Wars. The term is a cant one. "An Abram cove," as Decker, in his *English Villanies*, calls one of those mendicants, meant one who personated a "Tom o' Bedlam." He would "disguise himself in grotesque rags, with knotted hair, long staff, and with many more disgusting contrivances to excite pity," but he did not hesitate to live by thieving too; when detected in pilfering or in any species of depredation, he pleaded the immunities of a Bedlamite. This word connoted originally an inmate of the lunacy ward of Bethlehem Hospital, London, under the patronage of the patriarch Abraham. Wearing a badge for identification, such a man was formally permitted to roam about the country when discharged and solicit alms. Many mendicants took wrongful advantage of this privilege and preyed upon the charitable. The term is still preserved in the slang phrase "to sham Abraham."

A′BRAHAM'S BOS′OM. A term used to designate the abode of bliss of the blessed, not only among Jews but among Christians. Lazarus reclining in Abraham's bosom was a figurative expression. In Byzantine and mediæval art the souls of the blessed are represented as being taken into Abraham's bosom in the form of little children. Abraham is the central figure in the fore-court of heaven.

A′BRAHAM THE JEW AND THE MER′CHANT THE′ODORE. A mediæval tale of the conversion of a Jewish money-lender, after occurrences in which figures prominently the miracle-working power of the great image of Christ in the copper market at Constantinople. Theodore, in financial straits, twice borrows money of Abraham on the security of his oath before the statue, and only after repeated losses does he find, while on a foreign shore, means to repay the loan. For lack of other mode of transmission the merchant trusts his box of money to the sea. It is carried by the waves safely home to the Jew, who denies, however, after the return of Theodore, that he has received it. The Christian's prayer before the image, where he has brought Abraham to take oath, leads the Jew to confession of the Christian faith.

ABRA-IGORROTE, ä′brȧ ē′gôr-rō′tȧ, or GUINAANE. A head-hunting tribe of the province of Abra, northern Luzon. See PHILIPPINES.

ABRANTES, ȧ-brän′tȧs. An ancient town in Estremadura, Portugal, situated on the Tagus, 70 miles northeast of Lisbon (Map: Portugal, A 3). It is strongly fortified, being surrounded by walls and protected by a castle. It is remarkable for the grand architectural features of its monastery. By way of the Tagus, Abrantes has a brisk trade with Lisbon in grain, olive oil, wine, and fruit. From this town Marshal Junot took his title of Duke of Abrantes. Pop., 1900, 6500.

ABRANTES, ȧ′bräɴ′tȧs′, DUC D'. See JUNOT.

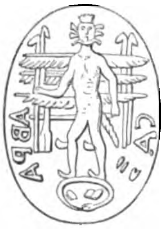
ABRANTES, DUCHESSE D'. See JUNOT.

ABRA′SIVES (Lat. *ab*, away + *radere*, to scrape, scratch). The natural and artificial substances used in the arts for scraping, grinding, and polishing. The principal abrasives now used are corundum, emery, garnet, quartz, carborundum, diatomaceous earth, tripoli, pumice, rouge, crushed steel, abrasive stones, and sand. *Corundum* is a crystalline mineral substance, large deposits of which are mined in North Carolina. The process of manufacturing corundum ore into an abrasive powder consists in crushing and grinding it to a powder, which is mixed with water and fed onto sieves or screens; the properly ground material passes through the screens and the coarser powder remains on top and is reground. The remainder of the process consists in refining and sizing the powder into eight or ten grades for the market. *Emery* is an impure grade of corundum, and is prepared for the market by crushing, screening, and sizing, like corundum proper. Emery is used in the form of powder for polishing plate glass and stones, as emery paper and as emery wheels. Emery paper or emery cloth is paper or cloth covered with hot glue and dusted with powdered emery. Emery wheels are sometimes solid emery stone, and sometimes wheels the faces of which are coated with emery. *Garnet* occurs in segregated masses scattered through other rocks. Formerly the process of production was to separate the garnet masses from the barren rock by hand after the rock had been broken down by picks or by blasting. This method of separation resulted in the loss of a considerable portion of the garnet in the rock, and a process has recently been perfected by which the rock is crushed by machinery and the garnet separated from the barren rock by water. Garnet is harder than quartz, and, unlike quartz, does not wear smooth, but by its cleavage presents new cutting edges. It is used chiefly in the form of garnet paper or as a facing for cylinders, disks, belts, etc., for smoothing and finishing wagons, cars, carriages, wooden parts of bicycles, furniture, etc., and in boot and shoe manufacture for smoothing and polishing the heels and soles. *Carborundum* is an artificial product manufactured by a single American company whose works are at Niagara Falls, N. Y. The raw material for carborundum manufacture consists of 34.2 parts coke, 54.2 parts sand, 9.9 parts sawdust, and 1.7 parts salt. This mixture is smelted by electricity in special furnaces of fire-brick 16 feet long, 5 feet high, and 5 feet wide. In the centre of the end walls are the terminals or electrodes, each of which consists of 60 carbon rods 30 inches long and 3 inches in diameter, into the outer ends of which small pieces of ⅜ inch copper rods are fixed. A square copper plate bored with 60 holes holds the carbon electrodes in place. The carbons having been put in place from the inside of the furnace, the spaces between them are tightly packed with graphite, which prevents the oxidation of the carbons and adds materially to their durability. The charge is next thrown into the furnace until it is a little more than half full, when a semicircular trench about 21 inches in diameter is made the full length of the furnace. Into this trench the core of coke is placed and built up to form a cylinder 21 inches in diameter. Around this core more material is packed to the full height of the side walls, and heaped above their tops, the furnace then being ready for operation. This consists of passing an electric current through the charge between the two terminals, which is maintained for thirty-six hours, after which the furnace is allowed to cool slowly for twenty-four hours, when the side walls are torn down and the charge removed. The carborundum forms a layer about 10 or 12 inches thick around the coke core. This is crushed and treated with dilute sulphuric acid for three days at a temperature of 100° C. to remove the iron and alumina. The clean material is then washed with water, dried, and graded according to fineness. Carborundum is used like emery and garnet in the manufacture of abrading cloth, cylinders, wheels, etc., and in the form of powder for polishing stones, steel balls, etc. *Diatomaceous* or *infusorial earth* is a natural product consisting of the siliceous framework of diatoms, which is ground and used principally in polishing metals and finishing wood. *Tripoli* is distinguished from infusorial earth by the mode of origin, it being the porous silica left from a siliceous limestone from which the lime has been leached, leaving the silica. The natural product is ground in a mill and sifted for use in polishing metals, horn, shell, etc., and is also cut out into the form of disks and used in household filters for filtering water. *Rouge* as usually sold is made by dissolving iron in sulphuric acid so as to form iron sulphate; this salt is heated and the sulphur driven off, leaving a residue of sesquioxide of iron, which after washing is known as rouge. Rouge is used for polishing plate glass. *Crushed steel* and *steel emery* are manufactured preferably from pieces of high grade crucible steel heated to a temperature of about 2500° F. and then quenched in a bath of cold water or other suitable hardening solution which gives the steel a granular structure. The pieces are then reduced to powder by powerful hammers or crushing machines, after which the steel particles are tempered in the following manner: They are placed in a steel pan or cylinder and heated to a temperature of 450° F., and then cooled by being subjected to cold air in various ways. The final process is the grinding and sizing of the powder. Steel emery is made exactly like crushed steel but is given an intensely hard temper. Crushed steel ranks close to the diamond in hardness. Crushed steel and steel emery are extensively used in stone sawing and polishing, in lens grinding, glass beveling, brick grinding, and by lithographers, engineers, and plate glass manufacturers. *Grindstones* are cut from a hard sandstone of a peculiar quality, and *whetstones, scythestones* and *oilstones* are quarried and cut from similar natural rocks. *Millstones* or *buhrstones* are cut down or built up from various kinds of rock; the American buhrstone is a quartz conglomerate which is known under various local names; the German buhrstone is a basaltic lava, and that which comes from France and Belgium is a hard, porous material consisting of small particles of silica in a calcareous cement. The foreign stone is brought into the United States in small pieces, which are cut and built up into wheels with cement, but the domestic stone is worked down from quarry blocks into a solid wheel of the required size. Millstones are used for grinding grains, cement, pigments, etc. *Sand* is extensively used as an abrasive in the form of sandpaper and in the sandblast for cleaning castings, structural iron-work, etc. *Pumice* is a volcanic ash or tufa which may be ground into powder for scouring and polishing or sold in lumps for similar purposes. See SANDPAPER; SANDBLAST.

For a detailed description of the occurrence and preparation of abrasives, reference should be made to the *Annual Reports of the United States Geological Survey, Mineral Resources of the United States*, which also include statistics of production and importation.

ABRAVANEL, ȧ-brä'vȧ-nĕl'. See ABRABANEL.

ABRAX'AS. A term used by the Gnostic sect of Basilides to designate the multiform manifestation of the Supreme Deity in the universe, because when the word is written with Greek letters, these letters, computed numerically, have the value of 365, which equals the solar year and the number of *eons* or worlds that formed the total Gnostic universe. The word, in harmony with the magical tendencies of the East in the second century, was engraved on precious stones and used as an amulet. These gems often bore strange figures of Gnostic deities, sometimes part lion, or serpent, or cock, some connected with Jewish, some with Egyptian, and some with Græco-Roman worship. They are characteristic of the hybrid religious movement that fought for supremacy with Christianity. In many cases the figure represented has the head of a cock, the body of a man, and two serpents instead of legs, and is armed with a whip and shield, with the inscription ΙΑΩ (*iaō*), derived from the Hebrew name for God. Other divine manifestations inscribed or represented on the gems are Sabaoth, Adonai, Eloï—Hebrew names for God—Astaphaios, Ialdabaoth, Chnouphis. Others have names or figures of Jewish angels (Michael, Gabriel, Uriel, Onoel); others those of Egyptian gods (Isis, Osiris, Phtah, Neith, Hathor, etc.); others those of Greek gods and heroes (Zeus, Hecate, Aphrodite, Hercules). It is a fact that the Christian Church and the Christian emperors of the fourth and fifth centuries found it far more difficult to stamp out magical beliefs and practices than those of official paganism, and of this these stones are the clearest proofs. (See ABRACADABRA and AMULET.) For futher information consult Martigny, *Dictionnaire des antiquités chrétiennes* (Paris, 1877), and Kraus, *Real Encyklopädie der christlichen Alterhümer* (Freiburg, 1882-86).



ABRAXAS STONE.

ABREAST'. See BEARING.

ABRIDG'MENT (O. F. *abrigier*, Lat. *abbreviare*, to shorten). A condensation or abbreviation of a book or treatise. In the law of copyright an abridgment, when fairly made, is deemed a new work, and consequently its publication is not an infringement of the copyright. An abridgment is to be distinguished in the law of copyright from a compilation. The former is a condensation of the substance of the copyrighted article, while the latter is a reproduction in part, at least, of the language of the copyrighted article and is held to be an infringement. Abridgments of the rules of law by various writers have been of great importance in the development of the English common law. Before our modern methods of reporting decided cases, the abridgments of Comyn, Viner, Bacon, and others were highly valued as text-books, and were the chief repositories of legal learning. They are still valuable as authorities as to the rules of the early law.

ABROC'OMAS AND ANTHI'A. One of the oldest works of Greek prose fiction; also known as *Ephesiaca, or the Loves of Anthia and Abrocomas*. It was by an otherwise unknown writer named Xenophon of Ephesus, of uncertain date, supposed to have lived about the time of the Antonines. It is in simple narrative style, but abounds in improbable incidents. The story is the ultimate source of *Romeo and Juliet*.

AB'ROGA'TION (Lat. *abrogatio*, from *ab*, away + *rogare*, to ask, propose a law). In law, the annulling or repealing of a former law by an act of the legislative body. Abrogation may be accomplished by express provision of the later act, which in general terms abrogates all laws inconsistent with the new one, or names specifically the laws to be abrogated, in which case the abrogation is said to be *express*. Abrogation may also be *implied*, as where the new law is necessarily inconsistent with earlier laws. In Scotland, also, though not in the United States, when a statute by lapse of time has ceased to be suitable to the times and conditions, it is impliedly abrogated. Abrogation of statute law revives any provision of the common law which the earlier statutes had abrogated. See REPEAL; STATUTE.

ABROLHOS, ȧ-brō'lyȯs. A group of islands and shoals, 50 miles off the east coast of Brazil and 50 miles east of Caravellas, forming part of the state of Bahia. The largest island of the group, Santa Barbara, is the site of a lighthouse (Map: Brazil).

A'BRUS (Gk. ἁβρός, *habros*, graceful, pretty). Of the natural order Leguminosæ, the only known species, *Abrus precatorius*, is a shrub originally belonging to India, but now not uncommon in the West Indies and other tropical regions. The roots possess properties similar to those of the common licorice. The seeds, often called crab's eyes, are nearly spherical, as large as small peas, of a scarlet color, with a black scar, and are familiar in old flower-work made of shells, and are often used as beads. They are poisonous. Children sometimes crush them accidentally when stringing them; and if introduced into the eyes when crushed, violent inflammation results. In India and Australia they have been used criminally, to kill cattle, as reported by the British Cattle Plague Commission, in 1870.

ABRUZZI, ȧ-brōōt'sē, and **MOLISE**, mō-lē'sȧ. A division (*compartimento*) of central Italy, situated between the Apennines and the Adriatic Sea, and comprising the provinces of Teramo (Abruzzo Ulteriore I.), Chieti (Abruzzo Citeriore), Aquila (Abruzzo Ulteriore II.), and Campobasso (Molise) (Map: Italy, H 5). The area is 6380 square miles. It comprises the wildest and loftiest portion of the Apennines. The rent and jagged mountain groups are very picturesque and reach in Il Gran Sasso d'Italia, or "the great rock of Italy," the highest of the chain, the elevation of 9600 feet. The highlands are clothed with luxuriant forests and slope precipitously on all sides, but especially toward the northeast shore. The rivers are numerous, but mostly very short, and, with the sole exception of the Pescara, are of little importance. The climate of the Abruzzi is raw in the higher regions; snow rests on the mountains from

October to April, and on some of the peaks all the year round. While the mountain slopes provide ample pasture for the numerous herds of cattle and swine, fertile valleys yield olives, rice, saffron, wine, and grains in abundance. Animal products form the chief article of export. Silk is produced to some extent. In former times the district was considered of much strategical importance, owing to its inaccessibility, which rendered it especially fit as a protection for Naples. Population in 1881, 1,317,215; in 1901, 1,441,551; 1906 (estimated), 1,479,198. The inhabitants lead a pastoral life. Consult: A. de Nino, *Usi e costumi abruzzesi* (Florence, 1879-91).

ABRUZZI, Prince Luigi Amadeo of Savoy-Aosta, Duke of the (1873—). An Italian traveler and Arctic explorer. He is the son of ex-King Amadeus of Spain, was born in Madrid, and studied at the naval college in Leghorn. In 1897 he attracted much attention by making the first ascent of Mount Saint Elias. On June 12, 1899, he set out on his voyage toward the North Pole, his plan being to leave his ship, the *Stella Polare*, in harbor, and send northward a series of sledge expeditions. He spent one winter in the Bay of Teplitz, and would have remained a second had not a serious injury to the vessel compelled his return. One of his sledge parties, under Captain Umberto Cagni, attained the northernmost latitude as yet reached (86° 33′, 239.15 statute miles from the Pole). On September 6, 1900, he returned to Christiania. His explorations determined the northern coast of Franz-Josef Land and the non-existence of Petermann Land. The story of this expedition is told in his book, *On the "Polar Star" in the Arctic Sea* (1903). He also wrote *The Ascent of Mt. St. Elias* (1900).

AB′SALOM (Heb., father of peace). The third son of King David (II. Samuel iii: 3; I. Chronicles iii: 2), whose romantic career makes him a prominent figure in Old Testament history. Encountering the ill will of David through slaying Amnon, another son of the King, in revenge for an outrage committed by Amnon upon his sister Tamar (II. Samuel xiii), Absalom was banished from his father's court, and more than five years elapsed before he was again admitted into the presence of his father (II. Samuel xiv). A complete reconciliation, however, appeared out of the question, and Absalom shrewdly laid his plans to ingratiate himself in the hearts of the people (II. Samuel xv: 1-6). When the moment appeared ripe he organized a rebellion against David, which soon assumed such dimensions as to force the King and his court to leave Jerusalem and fly for refuge to the east of the Jordan. Absalom entered Jerusalem, and the rebellion would probably have been successful but for the crafty intrigues of Hushai, who, while pretending to espouse the cause of Absalom, gave counsel which enabled David and his adherents to obtain time for gathering a following (II. Samuel xv: 17). A decisive battle was then fought "in the wood of Ephraim" (II. Samuel xviii: 6), in which Absalom lost his life. According to the narrative, Joab, chief counselor of David, sent three darts into Absalom's heart while he was hanging from an oak, in the branches of which his flowing locks, while he was riding, became entangled. With Absalom's death the rebellion came to an end (II. Samuel xviii: 7-17). David is represented as having been profoundly grieved at the death of his son, and this grief is a reflection of the impression made upon the people by the romantic career of Absalom. Instead of denouncing him, the writer tells the story in a manner calculated to arouse at least partial sympathy for Absalom, who is described as a youth of extraordinary beauty and attractiveness (II. Samuel xiv: 25-27). Absalom was buried near the spot where he died, and the grave was marked by a great heap of stones (II. Samuel xviii: 17). The date of Absalom's death may be fixed approximately at B.C. 980.

ABSALOM AND ACHITOPHEL, ȧ-kĭt′ŏ-fĕl. The title of a poetical satire by John Dryden, published in 1681. Absalom represented the Duke of Monmouth, illegitimate son of Charles II., whose character is said to have resembled that of the rebellious son of King David. Achitophel, David's disloyal adviser, stood for the Earl of Shaftesbury, against whom the satire was directed. It was intended to justify King Charles II. as against the Whig party. As a political document it was extremely effective, and it has been highly praised for its vigorous literary qualities. The second part, published in 1682, was added by Nahum Tate.

ABSALON, äb′sä-l*o*n (1128-1201). A Danish ecclesiastic, statesman, and general. He was educated at Paris, and, during the reigns of Valdemar I. and Canute VI., served as minister and general. In 1158 he was chosen bishop of Roeskilde, and in 1178 became archbishop of Lund. Absalon aided in the formulation of the code of Valdemar, and to his influence is due the *Historia Danica* of Saxo Grammaticus.

AB′SCESS (Lat. *ab*, *abs*, away + *cedere*, to go, Gk. *ἀπόστημα*, *apostēma*, distance). A collection of pus formed within some tissue or organ of the body where no cavity previously existed, and due to injury, toxication, or septic infection from bacteria. An abscess is thus formed: First, the capillary vessels become overcharged with blood, in consequence of inflammation. The fluid part of the blood, flowing very feebly, together with some of the white blood corpuscles, exudes through the walls of the capillary vessels and becomes pus. This matter gradually disintegrates the tissues, and so makes for itself a larger cavity, and frequently, by gradual dissolution of the adjacent parts, works its way either to the surface or to some natural cavity of the body. Pus thus making its appearance in a different part of the body from where it was formed, constitutes a "cold abscess." It also occurs that when the purulent matter does not find any outlet, either naturally or artificially, it is gradually absorbed. In abscesses superficially seated—either in or close under the skin—the early treatment consists chiefly in promoting the formation of pus by the application of moist and warm bandages or poultices, or limiting the process by the application of ice. The next step is the removal of the pus and provision of drainage. When this is too long delayed, even poisoning may ensue. An abscess must be regarded not as a disease in itself, but as the result of disease, or as an effort of nature to remove injurious matters from the system.

ABSCHATZ, äp′shȧts, Hans Assmann, Freiherr von (1646-99). A German poet of the second Silesian School. He was born at Würbitz, and studied at Strassburg and Leyden. He was appointed life deputy from the principality of Liegnitz to the Silesian Diet at Breslau in 1679. Strongly patriotic in tone, he was one of the best known of German seventeenth century poets. He translated the *Pastor Fido* from the Italian of Guarini. His *Poetische Uebersetzungen und Gedichte* were published after his death (edited by Christian Gryphius, 1704). Selections also appear in Volume VI. of W. Müller's *Bibliothek deutscher Klassiker des siebzehnten Jahrhunderts* (1824).

ABSCHIEDS-SYMPHONIE, ăp′shêts-zêm-fô-nē′ (Ger. "Farewell Symphony"). A symphony composed by Haydn, dated 1772 on the autograph score. It was written as an appeal to the Prince Eszterházy to allow the musicians leave of absence. One after another stopped playing and left the orchestra, and Haydn's object was attained through this delicate hint. See HAYDN.

ABSCIS′SA. See ANALYTIC GEOMETRY.

ABSCOND′ING (Lat. *abs*, away + *condere*, to put up). In law, the act of leaving the state or concealing oneself therein for a fraudulent purpose, such as hindering, delaying, or defrauding one's creditors. It is not a common-law offense for one to go beyond the boundaries of his country, nor to treat his house as his castle, that is, as a place into which an officer has no right to break in order to serve civil process. But if a debtor goes abroad or conceals himself to avoid the service of legal process, the creditor, being unable to employ the usual methods, is entitled, upon resorting to the proper proceedings, to seize his property. The rights of creditors against absconding debtors are now generally regulated by statute. See ARREST; ATTACHMENT; BANKRUPTCY; INSOLVENCY; LIMITATION OF ACTIONS.

AB′SENTEE′. A capitalist, especially a landowner, who derives his income from one country and spends it in another. Ireland offers the classic example of absenteeism and its attendant economic and social evils. A large part of the land is owned by members of the aristocracy, who administer their affairs by agents and rarely visit their possessions. This state of affairs dates in the main from the union with Great Britain and the transfer of Parliament from Dublin to London. It has always been a matter of bitter complaint. It is urged that the system drains Ireland of its wealth and leaves it in poverty. While some writers, notably McCulloch, have considered this complaint fundamentally wrong, there is a general consensus of opinion that absenteeism is hurtful to the economic interests of a region. It removes from the country its natural leaders, those whose wealth creates employment, and whose personal concern in the upbuilding of the country is essential to public welfare. It intensifies the struggle between classes and makes coöperation difficult. It is likely to result in misuse of the land by owners more bent upon securing maximum financial returns than upon maintaining and increasing its earning capacity, while the management of the paid overseer is not tempered by the spirit of *noblesse oblige* which generally prevails when the landlord is a resident. The voluminous discussion of the Irish question within and out of Parliament teems with references to absenteeism.

ABSENTEE, THE. A story by Maria Edgeworth (q.v.), published in 1812. It was one of the series called *Tales of Fashionable Life*, or *Fashionable Tales*.

ABSINTHE, ăb′sĭnth (Fr., from the Gk. *ἀψίνθιον*, *apsinthion*, wormwood). A bitter liquor, the base of which is an alcoholic solution of certain essential oils derived from a number of plants. The chief source is a form of wormwood, or absinthium (*Artemisia absinthium*). (For illustration, see Plate of ACANTHUS.) The leaves and tops of this plant, together with portions of angelica root (*Archangelica officinalis*), sweet-flag root (*Acorus calamus*), dittany (*Cunila mariana*), star-anise seeds (*Illicium verum*), and other aromatics, are macerated in alcohol for eight days and then distilled. The product is an emerald-colored liquor, to which anise oil is added, and which constitutes the genuine French *extrait d'absinthe*. Other absinthe of inferior quality is made from various herbs and essential oils, and adulterations are numerous. A law has recently been enacted in Belgium which forbids the manufacture, transportation, storage, and sale of absinthe in that country. Two kinds of absinthe are known in commerce, common and Swiss; the latter, prepared from highly concentrated spirits, being the more trustworthy. The chief places of manufacture are Neuchâtel in Switzerland and Bordeaux in France. The product is consumed mostly in France, though large quantities are exported to the United States. Absinthe was first used by the French soldiers in the Algerian War (1844-47), who mixed it with their liquor as a febrifuge, and who later introduced the habit in France. Absinthe-drinking has become in France so great an evil that its use has been prohibited in both the army and navy of that nation.

Absinthe when excessively used gives at first a feeling of exhilarated intoxication. Later the digestive organs are deranged, the appetite destroyed, then thirst, giddiness, ringing in the ears, hallucinations of sight, heavy mental oppression, anxiety, loss of brain power, and idiocy may succeed each other. The use of absinthe induces a condition of alcoholic intoxication plus the poisoning by the essential oils, notably by that known as absinthol, contained in the wormwood. It is doubtful whether the hideous pictures frequently drawn are true to life; they probably represent the extremes. Absinthe is, however, much more intoxicating than the ordinary liquors. Consult Mew and Ashton, *Drinks of the World* (New York, 1892). See LIQUEUR; WORMWOOD; ARTEMISIA.

AB′SOLON. A character in Chaucer's *Miller's Tale*. He was a parish clerk, who fell in love with the jealous carpenter's wife, but ludicrously failed of his suit.

AB′SOLUTE (Lat. *absolutus*, brought to a conclusion, final, complete, from *absolvere*, to loosen from, bring to a close, complete). A term employed in philosophy and theology with various meanings, but in every case in direct antithesis to the term *relative*. Many theological philosophers speak of God as absolute, meaning thereby that He *need* stand in no relation to anything distinct from Himself. Absolute means here independent of essential relations to other objects. Herbert Spencer speaks of absolute ethics, meaning ethics dealing with a standard that is unchanging, as opposed to the relative ethics of any particular place or time. With the Hegelians absolute means all-inclusive; essential relation is included in such a conception, but merely external relation is excluded: the universe, in the sense of all existence, including all the relations binding everything to everything else, is absolute in this meaning of the word; and the universe alone is absolute. Much of the discussion about the possibility of the absolute has turned upon the ambiguity of the word. So also with the question whether there can be knowledge of the absolute. If by the absolute is meant something that exists in itself apart from all knowledge, and if knowledge is considered as a relation between two independent things, the knower and the known, then knowledge of the absolute is impossible. This is Sir William Hamilton's (q.v.) contention, and also Spencer's (q.v.). If knowledge means exhaustive comprehension of every objective detail within the unity of a single consciousness, and yet if consciousness and its object are not looked on as independent of each other, then absolute knowledge would be possible on the supposition of the existence of a being that sustains all reality within its unchanging consciousness (T. H. Green). If knowledge is not synonymous with exhaustive knowledge, and yet if the object of knowledge is regarded as essentially related to the consciousness that knows, and if such an object also stands in essential relation to every other object, then all knowledge is partial knowledge of the absolute. See Knowledge, Theory of.

ABSOLUTE, Captain. A leading character in Sheridan's *The Rivals*, the son of Sir Anthony Absolute. He is a young soldier, and the lover of Lydia Languish, to gratify whose unpractical and romantic temperament he makes his suit in the assumed guise of a penniless Ensign Beverley. He thus wins her heart, and proves himself his own successful rival.

ABSOLUTE, Sir Anthony. A celebrated character in Sheridan's comedy of *The Rivals*. He is a choleric and apparently obstinate old gentleman, who is, however, at bottom entirely kind-hearted. He avows his excessive irritability in the first act: "No, no, Mrs. Malaprop. Jack knows that the least demur puts me in a frenzy." But when finally the lovers in the play are united, he shows himself most jovial and sympathetic.

ABSOLUTE VAL'UE. In the development of mathematics several artificial number systems have been formed, which are used in connection with the primitive system of natural numbers, e.g., negative numbers, -1, -2, -3, ..., imaginary numbers, $\sqrt{-1}$, $\sqrt{-2}$, ..., and complex numbers, $3+\sqrt{-1}$, $2-\sqrt{-3}$. The natural number which, multiplied by (-1), equals a given negative number, is called the absolute value of the negative number; thus, the absolute value of -2, expressed $|-2|$, is 2. Similarly, the coefficient of $\sqrt{-1}$ in an imaginary number is called the absolute value of the imaginary number; thus, the absolute value of $\sqrt{-3}$ (or $\sqrt{3}\,\sqrt{-1}$), expressed $|\sqrt{-3}|$, is $\sqrt{3}$. The modulus of a complex number (q.v.) is called its absolute value; thus, the absolute value of $3+\sqrt{-2}$, expressed $|3+\sqrt{-2}|$, is $\sqrt{3^2+(\sqrt{2})^2}$, a usage due to Weierstrass.

ABSOLUTION. The remission of sin and its penalties may be divided into sacramental and canonical—one relating to the *forum internum*, and constituting the most important part of the sacrament of penance; the other to the *forum externum* and devoted especially to the remission of ecclesiastical censure. Their early history is closely connected, as in the first ages of the Church all grievous public sins incurred the penalty of absolute separation from the assembly of the faithful, and reconciliation could be obtained only by undergoing the penance imposed by the Church. The bishops were the chief ministers of absolution; but the whole body of the faithful were consulted as to the term of the public penance, since they, as well as God, were injured by the sin. With the gradual decrease of severity and of public penances, absolution was pronounced by the priest immediately after confession, if he judged the repentance sincere. Formal excommunication, however, could even in later days be remitted only by public absolution by the bishop or his deputy, and certain sins are still 'reserved' to the same authority for judgment. The power of judicial absolution in the name of God is attributed by Roman Catholics to all priests, on the basis of the commission in John xx. 23; the Protestant churches generally ascribe only a declarative power to their ministers, though the Church of England retains the absolute form in the Order for the Visitation of the Sick. The *form* of absolution, since none was given by Christ, has varied considerably; the Western Church down to the Twelfth Century, with rare exceptions, and the Eastern churches to the present time employing a deprecatory form ("May Christ absolve thee," etc.), for which the indicative form, *Ego absolvo te*, was definitively substituted by the Council of Trent. The difference in form, however, has implied no change in doctrine. See Confession; Penance; Discipline, Ecclesiastical.

ABSOLUTION, Day of. See Good Friday (so called from the ancient practice of emphasizing forgiveness upon that day).

AB'SOLUTISM (Lat. *absolutus*, complete, unrestricted, from *ab*, away + *solvere*, to loosen, free). That system of government in which the supreme power is vested in a ruler unchecked by any constitution or laws. It characterized all the ancient monarchies (a brief period in the case of the Roman Empire excepted), and has prevailed in all Oriental monarchies, down to Japan of a few years ago. The barbarian invasions replaced the absolute monarchy by feudalism in Western Europe, but with the growth of towns and the rise of the commercial classes came the necessity for a strong central government to protect the nation against the feudal barons, and the absolute king once more arose, master of a regular army, uniting in himself the different functions of the national life, religious as well as political. A mild form of absolute monarchy is familiar to the student of English history in the House of Tudor, with its strong-willed monarchs; but a representative absolute monarch of modern times is better seen in Louis XIV. of France, with his famous assertion, *L'état c'est moi* ("I am the state"). The only absolute monarchy existing in Europe now is that of Turkey. The events of 1905 made the term no longer strictly applicable to Russia (q.v.).

ABSOR'BENTS. See Lacteals; Lymphatics.

ABSORP'TION (Lat. *ab*, away + *sorbere*, to swallow). When certain fluids are brought together the molecules of one mix intimately with those of the other and *diffusion* takes place. If certain solids containing fluids are brought in contact with other liquids, some of the liquid passes into the solid and *absorption* takes place. Gases may also be absorbed similarly. Diffusion acting through an animal or vegetable membrane is called *osmosis*. Much of what is termed absorption in physiology is really osmosis. Most of the tissues of living bodies have the power of absorbing fluids—a property that often continues after death and until decomposition. Animal substances differ in absorbing power according to differences in the liquid, notably if they differ in specific gravity and if the fluids in the substances brought in contact are miscible. The following table from Chevreul shows the amounts of liquid absorbed by different substances in twenty-four hours:

100 Parts of	*Parts of Water.*	*Saline Solution.*	*Oil.*
Cartilage	231	125	
Tendon	178	114	8.6
Elastic ligament	148	30	7.2
Cartilaginous ligament	319		3.2
Cornea	461	370	9.1
Dried fibrin	301	154	

Activity of absorption, or *osmosis*, varies with the freshness of the membrane, being great soon after separation from the principal parts; and varies also with pressure, motion, and temperature. *Absorption of oxygen* by the blood in the lungs is apparently instantaneous, the change in color from dark red to bright red as soon as it arrives at the pulmonary vessels, showing the action of the gas it has taken from the atmosphere. This rapidity of absorption is due to the fact that in the circulation of the lungs the blood is spread out in the fine capillaries over a very large area, and to the incessant motion of the blood in the capillaries. Claude Bernard found that if a solution of iodide of potassium were injected into the duct of the parotid gland on one side of a living animal, the saliva discharged by the corresponding gland on the other side almost instantly afterward contained iodine. In a measureless instant, therefore, the iodine was taken up by the glandular membrane on one side, absorbed by the blood, carried to the heart, absorbed from the blood by the glandular membrane on the other side and furnished to the saliva. It is by this process of absorption that the elements of nutrition are taken from the intestines and conveyed to the tissues they are to nourish; the bones absorb much calcareous matter from the blood, cartilages less, and muscles less still; the brain takes more water than does muscle, and muscle more than bone. The active principles of drugs and poisons are dissolved by the juices in the stomach, and by osmosis pass, unchanged or slightly modified, into the circulation. (See LACTEALS; LYMPHATICS.) Opium dissolved by the liquids of the stomach is absorbed by the membranous lining, taken away by the blood and distributed well through the body; at the brain it acts on the brain cells and produces sleep or narcotism or insensibility. The quickness of absorptive action is shown in using hypodermic injections; a few moments after the syringe has punctured the skin of the forearm a severe pain in the foot is sensibly relieved.

ABSORPTION, IN PLANTS. The process by which substances are taken into the body. A few plants only, being devoid of any external cover to the protoplasm, are able to engulf particles of food, which may then be digested. The most prominent of these are the Myxomycetes (q.v.), or slime molds, which in the period of their vegetative activity consist of a mass of naked protoplasm (called a plasmodium), sometimes as large as one's two hands. These plasmodia, like huge Amœbæ (q.v.), creep about and envelop particles of decaying organic matter, etc., on which they feed. The zoöspores, or reproductive bodies, of some Algæ and Fungi are also microscopic bits of naked protoplasm, but they probably do not ingest solid food during this period. Inasmuch as the protoplasm of most plants forms on its surface, as the first step of development, a thin jacket of cellulose or some similar material, the taking up of solid substances is thereby absolutely prevented. Whether the body consist of one cell or many, it presents to the surrounding medium a continuous membrane with no visible openings. Through these cell-walls, therefore, neither solid nor gaseous substances can pass without previously undergoing solution. The materials whose absorption is to be explained are (1) dissolved substances or solutes, and (2) the solvent, water.

(1) SOLUTES. The protoplasm itself and its surrounding membrane (the cell-wall) contain a large amount of water (50 to 98%). This water may be conceived of as lying between the particles of which the substances named are composed, much as it stands between the close-set stalks of plants in a marsh. Since water always pervades the structures of plants, substances in order to enter the plant body must be soluble in water. When so dissolved they behave essentially as gases; their molecules, being then free to move apart, tend to distribute themselves equally throughout the solvent. But the diffusion of solutes is greatly retarded by the molecules of the water, so that it is much slower than the similar diffusion of gaseous bodies. It is also retarded somewhat by the particles of cell-wall when these also are encountered in the water. But the distances between the particles of the cell-wall are relatively so great that most solutes are able to pass freely between them. The structure of the protoplasm, however, is such that many substances cannot readily pass through it. Consequently, some materials which can enter the plant body may travel only through the cell-walls and may never enter the living protoplasm. The protoplasm permits at some periods substances to pass through it which at other times are excluded; probably due to ability to alter its structure on occasion. Such substances as can pass through the invisible spaces in cell-wall and protoplasm are therefore free to travel to any part of the plant body. If any such substances be removed from solution through use or storage, they will continue to be supplied from the regions of greater abundance, and consequently of greater pressure, to the regions of lesser pressure, i.e., where they are being used. The fact that different amounts of a given compound enter plants growing in the same soil is explic-

able mainly on this basis. Thus, wheat and clover may grow side by side; the ash of the wheat will contain 67.5% of silica, while that of the clover contains only 2.5%. This selective absorption must, however, be in part referred to the power possessed by protoplasm of regulating the admission of solutes.

(2) WATER. Entrance of water into the plant to supply losses by evaporation or consumption depends upon similar factors. In a living mature cell, the protoplasm usually lies in a thin layer close to the cell-wall and envelops a water-filled space, the vacuole. (See GROWTH.) Many substances are constructed by plants which cannot ordinarily pass through the protoplasm, and remain dissolved in the water of the vacuole or cell-sap. These substances exert upon the surrounding layer of protoplasm a definite pressure. If they were in gaseous form this would be their gas pressure. As they are dissolved, it is called their osmotic pressure. The osmotic pressure of solutes in the water outside the plant is usually less than that of solutes in the cell-sap. As the solvent moves toward the region of higher osmotic pressure, i.e., from a place where there is a greater number of water molecules in unit-space, to a place where there are fewer, water usually enters the plant. But if at any time the conditions are reversed, the solutes outside the plant having higher osmotic pressure than those inside, water will leave the plant. This happens in nature sometimes, and it is this condition that makes possible the destruction of weeds by common salt. Gases are absorbed in the same manner as solids; the apparent difference in their absorption by land plants is due to the fact that they mostly become dissolved (and so fitted for absorption) only when they come into contact with the water saturating the cell-wall. This condition among the larger land plants exists only in the walls of cells bordering intercellular spaces. (See AËRATION.) While land plants absorb gases chiefly from the atmosphere, doubtless some absorb them by the roots, notably the oxygen required for their own respiration.

ABSORPTION, ELECTRICAL. A phenomenon observed in electrical condensers (q.v.), in which the dielectric or insulating material between the conductors is non-homogeneous, e.g., a piece of glass. It is noted that if such a condenser is charged, then discharged and allowed to stand for a short time, there will appear another charge. If this is discharged, another charge will soon appear. These secondary charges are said to be due to electrical absorption. See ELECTRICITY.

ABSORPTION OF GASES. The phenomenon of the taking up or absorbing of gases by liquids and solids. The number of cubic centimeters of a gas which can be absorbed by one cubic centimeter of a given liquid at 15° C. is called the "absorption coefficient" of the liquid for the gas. The absorption coefficient of water for ammonia is 756; for carbon dioxide, 1.0; for chlorine, 2.4. The mass of the gas absorbed varies directly as the pressure; so, if a gas is forced into a liquid under high pressure, and if the pressure is afterward released, the gas will be evolved. This is what happens in the case of beer and aerated waters. The absorption of gases by solids is called *occlusion*. The most conspicuous illustration of this is the power of palladium to occlude nine hundred times its own volume of hydrogen.

ABSORPTION OF WAVES. Waves of any kind in any medium carry energy with them; and, if the energy decreases, the medium is said to absorb it or to exhibit "absorption." Thus, if white light falls upon red glass, i.e., if ether-waves which affect the normal human eye with the sensation "white" are incident upon glass which appears red to the same eye, all the waves except those which produce the sensation red are absorbed by the glass, while the others are transmitted. Bodies differ greatly in the quality and quantity of their absorptive power; but it is a general law that the absorptive power of a body equals its emissive power under the same conditions. (See RADIATION.) Absorption is due to the presence in the pure medium carrying the waves of some portions of matter whose own natural period of vibration is the same as that of the period of the waves; and, therefore, these portions of matter are set in vibration by "resonance" (q.v.). Thus, if a person sings a pure note near a piano it may be observed that the particular string of the piano which of itself gives the same note is set in vibration by the air-waves sent out by the singer.

If air-waves of any length fall upon a soft body, such as a cushion or a curtain, there is absorption, as is shown by the fact that the reflected waves are much less intense than the incident waves. The energy thus absorbed is not spent in emitting other waves, but is dissipated throughout the body producing heat effects. Similarly, if ether-waves fall upon an absorbing body, the energy absorbed is dissipated in general throughout the smallest particles of the body producing heat effects. See, however, FLUORESCENCE.

AB′STINENCE. See FAST.

AB′STINENCE SOCI′ETIES. Associations to promote total abstinence from alcoholic liquors as beverages. See TEMPERANCE.

ABSTRAC′TION (Lat. *abs*, away + *trahere*, to draw). In logic, the process by which the mind separates out marks or characteristics which are similar in various objects, and disregards the marks or characteristics by which the objects differ. It also occurs where characteristics of particular objects, or classes of objects, are replaced by a more general characteristic. An instance of the first kind is the formation of the class "biped" by the inclusion of all two-legged animals. An instance of the second type is the substitution of the general mark "reproductive" for the more special marks, "viviparous," "oviparous," "fissiparous," etc. The result of this process is also called an abstraction, or, if it appears as a word, a concept. The psychology of abstraction consists in describing the way in which the attention, in passing from one object to another, fastens upon an element common to all and dissociates it from its context. Abstraction is carried out in a state of active attention (see ATTENTION), as when the philologist searches out common or allied roots in different languages, or when the geologist identifies strata in different localities and forms the abstraction of a single epoch in which they were laid. The process is, however, facilitated by the sheer decay of mental complexes; a decay which obliterates small differences and reduces mere similarity to indistinguishableness. It thus comes about that we form sketchy, "abstract" images—as of "pen," "house," or "book"

—from similar things, and that one of these schematic images is sufficient to call up a large number of more concrete (unobliterated) ideas whenever an appropriate incentive is given. (See ASSOCIATION OF IDEAS.) Consult: R. H. Lotze, *Logic* (Oxford, 1888); W. James, *Principles of Psychology* (New York, 1890).

AB′STRACT OF TI′TLE. A brief and orderly statement in writing of the successive conveyances and other events through which a person claiming to own a parcel of land derives his title. A purchaser or mortgagee of real property is entitled—by law in England, by custom in the United States—to receive such an abstract from the vendor or mortgagor in advance of the consummation of the transaction, and it thereupon becomes the basis of the examination of title (q.v.), which it is the duty of the solicitor or attorney of the purchaser to make. A perfect abstract should furnish a complete history of the title sought to be transferred, showing not only the origin and nature of the vendor's interest, but also all incumbrances and other interests—such as mortgages, easements, recorded judgments, trusts, etc.—which affect his title. In England, where the practice of recording deeds does not generally obtain, the abstract is based upon the title deeds (q.v.), which are carefully preserved and transmitted with each transfer of the estate; while in the United States the public records of conveyances are the principal, but not the exclusive, source of the information upon which the maker of the abstract proceeds. See RECORDING OF DEEDS. Consult: Warvelle, *A Practical Treatise on Abstracts and Examinations of Titles to Real Property* (Chicago, 1892); Warvelle, *A Treatise on the American Law of Vendor and Purchaser of Real Property* (Chicago, 1902); Comyns, *On Abstracts of Title* (London, 1895).

ABSUR′DUM, REDUCTIO AD (Lat. a reducing to an absurdity). The method of proving a truth by showing that to suppose the proposition untrue would lead to a contradiction or absurdity.

ABSYR′TUS (Gk. ’Αψυρτος, *Apsyrtos*). In the legend of the Argonautic expedition (see ARGONAUTS), the younger brother of Medea. She carried him off with her when she fled with Jason from Colchis, and, according to the common version of the story, deterred her pursuing parent, Æetes, by cutting the boy in pieces and scattering his body on the sea for his father to gather up.

ABT, äpt, FRANZ (1819-85). A German song writer and musical conductor. He was born at Eilenburg and sent to the Thomasschule at Leipzig to be educated. Here he met Mendelssohn, who is said to have persuaded him to follow a musical career. He was appointed kapellmeister at the court theatre of Bernburg in 1841, but soon relinquished this position for a similar one at Zürich, where he remained for eleven years, obtaining great popularity as a teacher, composer, and leader of singing societies. He was called to Brunswick in 1852 as second musical director at the court theatre, was appointed court kapellmeister in 1855, and pensioned in 1881. He came to the United States in 1872 at the invitation of several choral societies, and everywhere met with a cordial reception. Abt was a prolific composer, and at the time of his death had published nearly 600 books (Hefte), some of them containing from twenty to thirty numbers. He belongs to that group of composers which includes Truhn, Kücken, and Gumbert. His vocal compositions are remarkable for their simplicity and clearness of melodic construction. Among these may be mentioned: *Wenn die Schwalben heimwärts zieh'n* ("When the Swallows Homeward Fly"); *Gute Nacht, du mein herziges Kind* ("Good Night, My Child"); *Schlaf' wohl, du süsser Engel* ("Sleep Well, Sweet Angel"); *Leuchtendes Auge* ("Marie, or, When I Am Near Thee").

ABU, ä′bōō. One of the Aravulli mountains (q.v.), India, over 5000 feet high. It is held in high esteem by the Jainas and is celebrated for its two magnificent temples of white marble, supposed to have been built in the twelfth and thirteenth centuries, and considered the finest specimens of Indian architecture.

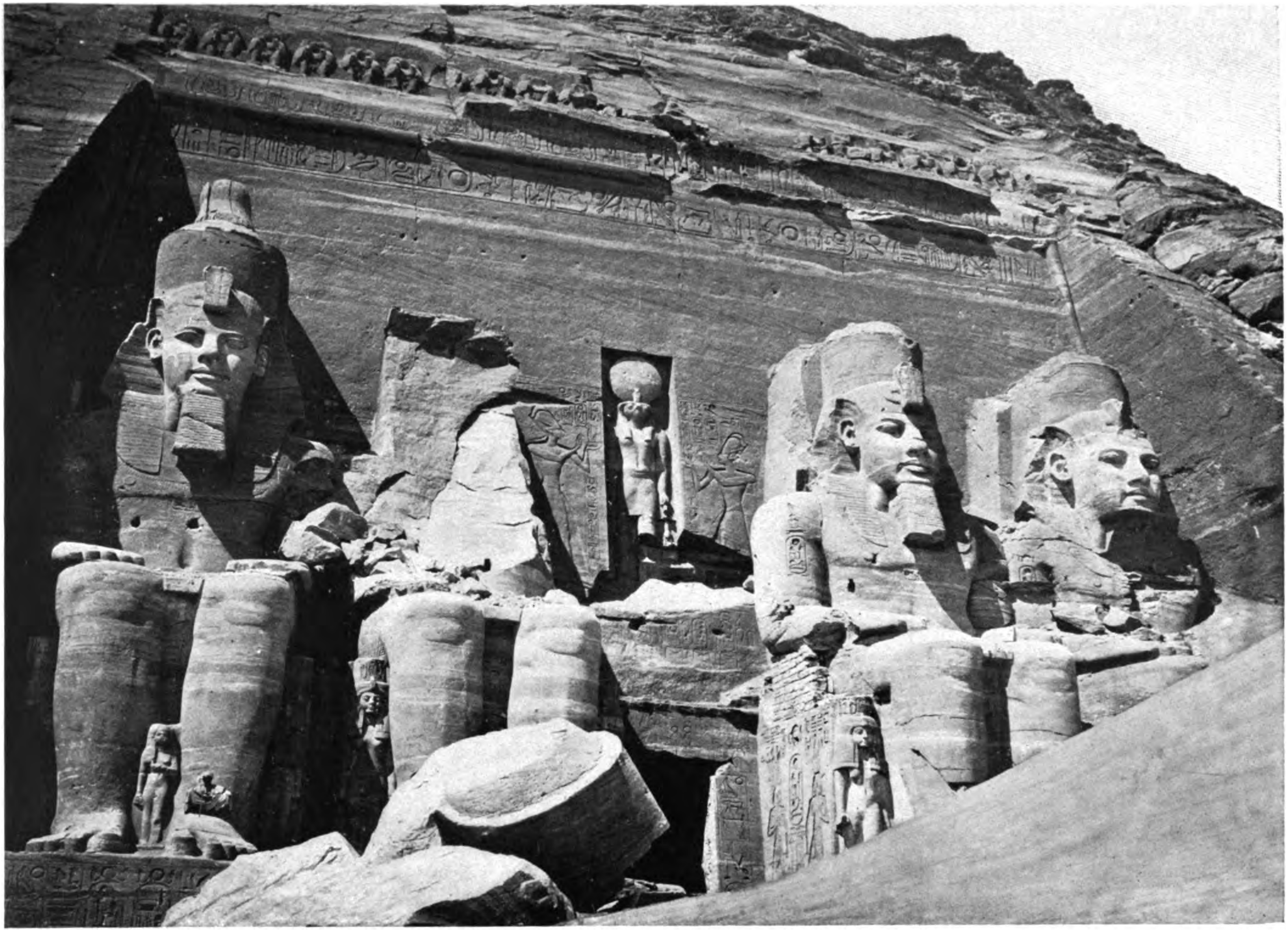
ABU, ä′bōō. The Arabic word for "father," which in modern Arabic often becomes abbreviated to *Bu*. It is prefixed to many Arabic proper names, as the equivalent syllable *Ab* is prefixed to Hebrew names. Example: Abu-bekr, or more properly, Abu-bakr, the 'father of Bakr.' But *Abu*, like the Hebrew *Ab*, often is not to be interpreted literally, but signifies possessor, or is used to indicate even more generally the notion of fullness, largeness, and the like; as in Abulfeda, "possessor of devotion," "the devoted one;" Abner, "the brilliant one," literally "father or possessor of light."

ABU-BEKR, ä′bōō-bĕk″r (his original name was 'abd al-Ka'bah ibn Abi Kuḥāfah) (570-634). The first caliph, father-in-law of Mohammed. He was a man of great influence in the Koreish tribe. In 632, when Mohammed died, he was made caliph, or successor of the Prophet. After defeating his enemies in Arabia, and warring successfully against Persia and the Byzantine Emperor Heraclius, Abu-bekr died (634 A.D.) and was buried at Medina, near the remains of Mohammed and the Prophet's wife Ayeshah (q.v.).

ABU-BEKR MOHAMMED IBN TOPHAIL, ä′bōō-bĕk″r mô-hăm′mĕd ’b′n tō′fȧ-ēl (1100-85). A famous Arabic physician, mathematician, poet, and philosopher. He was born in Andalusia and died in Morocco. His chief extant philosophical work is entitled *Hai ibn Yakzān*, "the Living, the Son of the Awake." It depicts the natural progressive development of the human faculties in a Robinson Crusoe born on an island till nature and God are known. To secure this communion, positive religion is valuable for the vulgar, but religious doctrines are only exoteric presentations of the mystic truth. The name of the hero and the subject are borrowed from Ibn Sina (Avicenna), with this difference, that while Ibn Sina's hero possesses a supernatural intellect, that of Ibn Tophail personifies a man of ordinary faculties. Later translations: Francisco Pons Bsigues (Saragossa, 1900), and Léon Gautier (Algiers, 1900).

ABU-BEKR MOHAMMED AL-RAZI, äl rä′zē. See RHAZES.

ABU-HASSAN, ä′bōō-häs′ȧn, surnamed THE WAG. The hero of *The Sleeper Awakened*, one of the stories of the *Arabian Nights*. He was a citizen of Bagdad who entertained the Caliph unawares and as a result met with several interesting experiences, finally becoming the trusted friend and favorite of the Caliph.



ABU-SIMBEL

STONE RELIEFS AT ENTRANCE OF ROCK TEMPLE

ABU JAAFAR IBN MOHAMMED, ä′bōō jä′fär ′b′n mō-hăm′mĕd, called EL SADIK, "The Righteous" (699-765). A caliph, one of the twelve imams of the Arabians. He wrote a work on alchemy, augury, and omens; and one of his pupils, Abu Musa Jabir ibn Haiyan of Tarsus, compiled a work of two thousand pages, in which he inserted five hundred of the problems of his master. Abu Jaafar is the principal Arabian representative of the pretended art of prophesying from cabalistic tablets, and all the superstitious disciplines of the Arabs are usually ascribed to him, notwithstanding the fact that these pseudo-sciences undoubtedly originated in countries farther to the east.

ABUKIR, ä′bōō-kēr′. An insignificant village on the coast of Egypt, about 13 miles northeast of Alexandria, probably the ancient Bukiris. The important city of Canopus was situated in the near vicinity. The castle of Abukir stands on the west side of the bay of the same name, which is west of the Rosetta branch of the Nile. This bay is celebrated on account of Nelson's victory here gained over the French fleet, August 1-2, 1798, the engagement being frequently called the Battle of the Nile. The French fleet was stationed in a curved line near a small island guarded by a battery; but Nelson, with his usual intrepidity, forced a passage with half of his fleet of fifteen vessels between the island and the French line of battle, while the other half attacked the enemy in front. The French admiral De Bruyes was killed by a cannon-ball, and his flag-ship, *l'Orient*, was destroyed. The French fleet was completely defeated, and only two vessels escaped. Napoleon defeated the Arabs here on July 25th, 1799, and Sir Ralph Abercromby (q.v.) repulsed the French near this point in 1801 (the engagement being known as the battle of Alexandria).

ABU KLEA, ä′bōō klā′ȧ. A place in the Sudan situated on the route between Korti and Metemme, both of which are on the great bend of the Nile below Khartum. It was the scene of a battle fought on January 17, 1885, in which the Mahdi's forces were defeated by the English troops under Sir Herbert Stewart. See MAHDI.

ABUL ALA AL-MAARRI, ä′bōōl ä′lȧ ȧl-mȧ-ăr′rē (937-1027). An Arabian poet and philosopher. He was born in Syria, and at an early age lost his eyesight. In his poems—mostly of a philosophical nature—he sets up purity and unselfishness as the highest ideals that man could follow. A collection of his poems was made at Cairo (1306). Consult Kremer, *Ueber die philosophischen Gedichte des Abû l-Alâ al-Ma'arrî* (Vienna, 1888).

ABULCASIM, ä′bōōl-kä′sēm. Commonly termed by European historians ABUL-KASIS. A famous Arabic physician. He was born at El-Zahra, near Cordova. The exact date of his birth is unknown. He died in his birthplace 1106. His great work, *Al-Taṣrif*, an encyclopædia of medicine, is of much interest, the treatise on surgery contained in it being the best that has come to us from antiquity, and still of importance in tracing the progress of surgery. A partial Latin translation of Abulcasim's work was published in Augsburg, 1519; the section on surgery was published in the original Arabic with a Latin translation by Channing (Oxford, 1778, two volumes).

ABULFARAJ, ä′bōōl-fȧ-räj′. See BAR HEBRÆUS.

ABULFAZL, ä′bōōl-fä′z′l, **MUBARAK-I ALLAMI** (sixteenth century). Vizier and historiographer of Akbar (q.v.), the great Mongol emperor. His chief work is in two parts; the first part (*Akbar Nāmah*, or Book of Akbar) is a complete history of Akbar's reign, and the second half (*Āyin-i-Akbar*, or Institute of Akbar) gives an account of the religious and political constitution and administration of the empire. The style is excellent, and the second part is of unique and enduring interest. The Persian text of the *Akbar Nāmah* is edited in the *Bibliotheca Indica* (1873-87), and a translation is now being issued by Beveridge in the same collection. The *Āyin-i-Akbar*, edited in the *Bibliotheca Indica* (1867-77), is translated by Blochmann and Jarett (1873-94) in the same series. Abulfazl died by the hand of an assassin while returning from a mission to the Deccan in 1602.

ABULFEDA, ä′bōōl-fȧ-dä′, Arabic ABŪ AL-FIDĀ' ISMĀ'ĪL IBN 'ALĪ 'IMĀD AL-DĪN (1273-1331). A Moslem prince and historian. He was born at Damascus. During his youth he distinguished himself in several campaigns against the Crusaders. He inherited the principality of Hamah, Syria, in 1298, but in consequence of a dispute over the succession the dignity was abolished by the Sultan. It was restored in 1310 by Sultan Malik al-Nasir and bestowed upon Abulfeda for distinguished military services. He was given practically sovereign powers. From 1310 to the time of his death he ruled over the principality, visited Egypt and Arabia, and patronized literature and science. Among his important writings were *An Abridgment of the History of the Human Race*, in the form of annals, from the creation to 1328. The work is partly a compilation and partly original. It is important as historical material for the era of the Crusades. There are several translations from the original Arabic. A part is contained in the first volume of Muratori, *Scriptores Rerum Italicarum*. The part preceding the Mohammedan era was rendered into Latin by Fleischer as *Abulfedæ Historia ante Islamitica* (Leipzig, 1831); the part on the life of Mohammed into English by W. Murray (London); and the later part by Reiske and Adler (*Annales Moslemici*, 5 vols., Copenhagen, 1789-94). The *Geography* of Abulfeda is chiefly valuable for the history and description of the Mohammedan world. A complete edition was published by Reinaud and de Slane in Paris (1840); and a French translation by Reinaud appeared in 1848.

ABUL-HASSAN, ä′bōōl-hȧs′sȧn. See JUDAH, BEN SAMUEL.

ABULIA, ȧ-bōō′lĭ-ȧ. See PSYCHIATRY.

ABUL KASIM MANSUR, ä′bōōl kä′sēm mȧn-sōōr′. See FIRDAUSI.

ABÚLONE, ȧ-bōō′lō-nȧ. A wild tribe in Zambales province, Luzon. See PHILIPPINES.

ABUL SU'UD, ä′bōōl sụ-ōōd′ (1828—). An Arabian poet. He was born in a village of Lower Egypt of poor parents, and was one of a number of pupils annually selected from the primary schools to take the course in languages at the institute founded at Cairo by Mehemet Ali. He at first imitated the elegiac poets of Arabia; afterward his verses, many of which became very popular, were distinguished by a wealth of ideas and by voluptuous mystical tendencies. The accession of Said Pasha inspired Abul Su'ud to a splendid *kacida* (ode), and the fall of Sebastopol was celebrated by him in a dithyramb which voiced an appeal for universal brotherhood, an idea till then little known in the Orient.

ABUL WEFA, ä′bōōl wā′fȧ. See Mohammed ben Mohammed ben Yaḥaya.

ABUMESACKA, ȧbōō′mȧ-sä′kȧ (native name). A large catfish of the Nile (*Charotes laticeps*).

ABUNDA, ȧ-bōōn′dȧ. A Bantu people of Angola, living partly on the low-lying coastlands and partly on the terraced escarpments, and hence divided into "highlanders" and "lowlanders." They have long been in contact with Europeans, and there is a considerable admixture of white blood, largely accounting for their enterprise, which travelers praise highly. Most of them speak both Portuguese and Umbunda, a trade language which is current over vast areas. It is said that, with a knowledge of Umbunda and Ki-Swahili, also a Bantu dialect, a traveler can make his way across the continent from Benguela to Zanzibar.

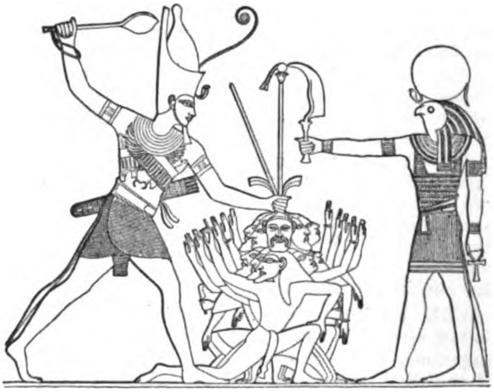
ABU NUWAS, ä′bōō nōō′wȧs, al-Ḥasan ibn Ḥāni al-Ḥakami (762?-810?). One of the most celebrated Arabic lyric poets; born in al-Ahwaz; lived a riotous life in Basra, Kufah, and Bagdad, though under the special favor of al-Harun and al-Amin. His collected poems contain 4900 verses. Those which celebrate wine are best known; but he also wrote love poems, satires (one of which was the cause of his death), poems on the chase and on asceticism. He has been called the Heine of Arabic literature. His *Diwan* has been edited and partly translated by von Kremer (Vienna, 1855) and Ahlwardt (Greifswald, 1861). Compare Brockelmann, *Geschichte der arabischen Litteratur* (1898), i. p. 75.

ABU SAID KHAN, ä′bōō sä-ĕd′ kän. See Mongol Dynasties.

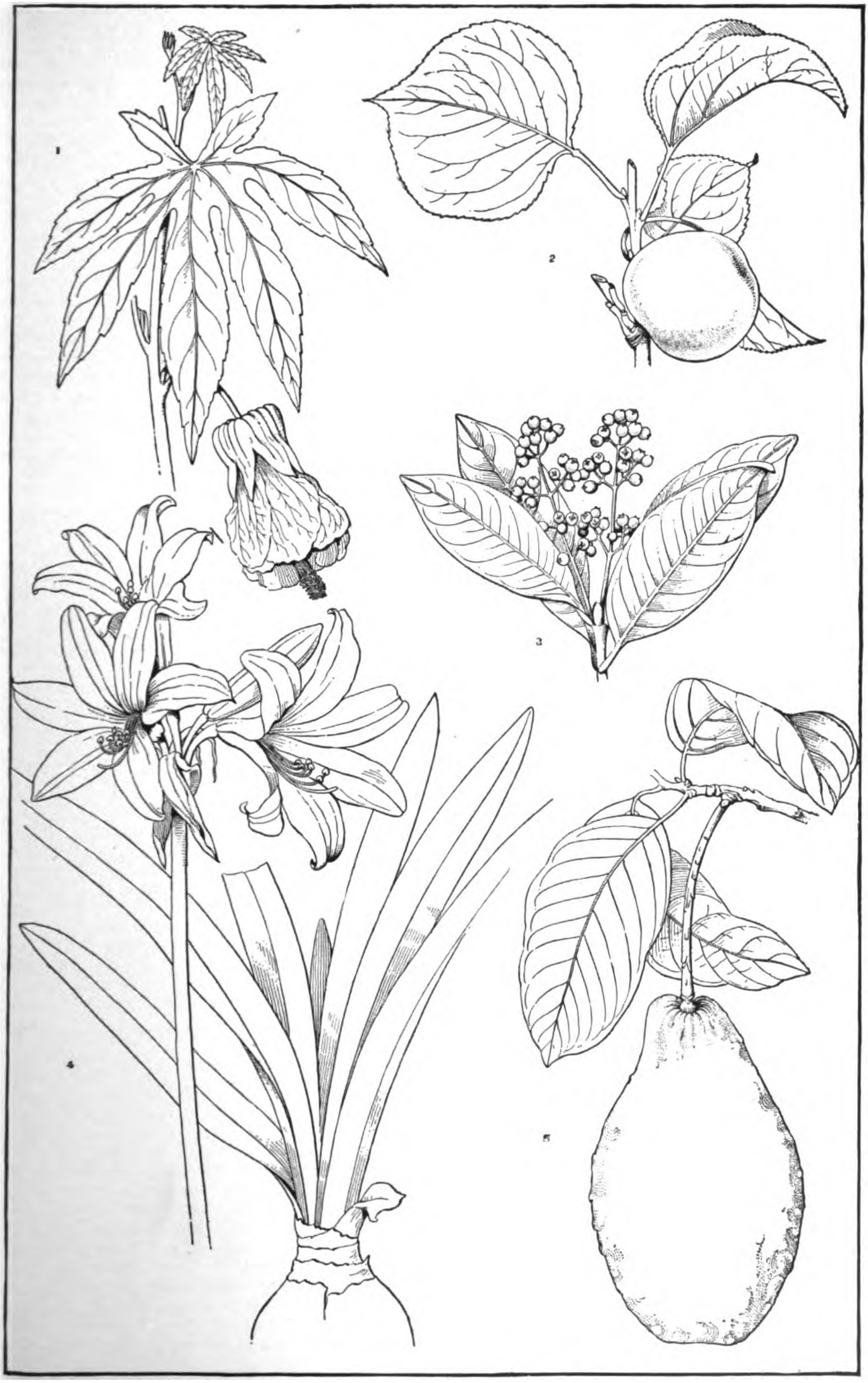
ABUSE′ OF PROC′ESS. The wrongful employment of a regular judicial proceeding. Courts of justice, quite as much for their own protection as for that of the party injured thereby, refuse to lend themselves to the abuse of their procedure, and may, accordingly, stay or dismiss actions and strike out defenses which are manifestly frivolous or vexatious. The question whether an allegation or a denial comes under this description is addressed to the discretion of the court. The jurisdiction to prevent or redress such abuse may be exercised on the motion of the party aggrieved or at the instance of the court itself. In order to sustain an action for malicious abuse of civil process, it is necessary to allege and prove both a want of probable cause and the existence of a malicious motive. Consult: Newell, *Law of Malicious Prosecution, False Imprisonment, and Abuse of Legal Process* (Chicago, 1892). See Malicious Prosecution.

ABUSHEHR, ä′bōō-shĕr′, or **BUSHIRE,** bōō-shĕr′ (Pers. *Bendershehr*). A Persian seaport town on the east coast of the Persian Gulf, about 130 miles southwest of Shiraz, with which it is connected by a caravan route. It is situated at the extremity of a peninsula and has an extremely hot climate. Owing to its advantageous position as a terminal of one of the most important caravan routes of Persia, Abushehr formerly had a very considerable trade, in spite of the fact that its harbor is neither safe nor deep enough for heavy vessels, which are compelled to anchor outside. The exports consist of opium, raw cotton and silk, mother of pearl, carpets, tobacco, and hides, while the imports are made up chiefly of cotton goods, tea, metals, and sugar. Abushehr is the seat of several European consuls, as well as of a Persian governor, but its importance has very much diminished of late, and its population has shrunk from about 15,000 to about 2000.

ABU-SIMBEL, ä′bōō-sĭm′bĕl (Ibsambul or Ipsambul). A place on the left bank of the Nile in Nubia, lat. 22° 22′ N., the site of two very remarkable rock-cut temples. Both were constructed by Rameses II., who dedicated the larger to the gods Ammon of Thebes, Harmachis of Heliopolis, and Ptah of Memphis; the smaller to the goddess Hathor. The larger temple has a façade 119 feet broad and more than 100 feet high, adorned with four sitting colossi, each more than 65 feet in height, representing the King. Upon these are carved inscriptions commemorating the visit of Phœnician and Greek mercenaries in the service of King Psammetichus II. (594-589 B.C.). The interior of this temple, which is 180 feet in depth, contains two large halls and twelve smaller chambers and corridors, all decorated with sculptures and paintings. The great outer hall, 58 by 54 feet, is supported by two rows of square pillars, four in each row, 30 feet high; and to each of these pillars is attached a standing figure of the King, reaching to the roof. The walls of this hall are decorated with representations, in color, of victories over the Hittites and other enemies of Egypt. In front of the smaller temple are six statues, each 33 feet high, representing King Rameses and his Queen. These temples were discovered by Burckhardt. In 1892, Captain Johnston, R.E., repaired the front of the larger temple, and built two walls to protect the entrance against the drifting sand.



ABU TEMMAM, ä′bōō tĕm-mäm′, Habib (807?-846?). An Arabic poet, the exact dates of whose birth and death are uncertain. He was born in Syria, and his father is said by some authorities to have been a Christian. But few facts of his life are known. At an early age he came to Egypt, where he first became known as a poet. He led the life of a wanderer, and passed from Damascus to Mosul, thence to Bagdad, and finally settled for some time in Hamadan, where a large library was placed at his dis-



1. FLOWERING MAPLE (Abutilon venosum).
2. APRICOT (Prunus armeniaca).
3. ALLSPICE (Pimenta officinalis).
4. BELLADONNA LILY (Amaryllis Belladonna).
5. AVOCADO PEAR (Persea gratissima).

posal, from which he compiled four collections of Arabic poems. The most famous of these is known as the *Hamasa*—i.e., "heroic" anthology. Though Abu Temmam achieved high renown as a poet, his reputation rests chiefly upon this anthology. The Arabic text of the *Hamasa* was published by G. W. Freytag in two volumes (Bonn, 1828-47), and an edition has also been published in Bulak (1869) and Calcutta (1856). The German poet Friedrich Rückert published a German translation of the *Hamasa* (Stuttgart, 1846).

ABU'TILON (Ar. *aubūtilūn*), or Flowering Maple. A genus of mostly shrubby tropical or semi-tropical plants of the natural order Malvaceæ, including about seventy species. A number of species are grown like Geraniums or Fuchsias in pots in greenhouses and in summer planted out in borders. The leaves are long-stalked, often maple-like or vine-like, and generally edged or mottled with white; the flowers are pendant, one, two or more inches long, varying in color from red to yellow and white and intermediate shades. The more commonly cultivated species are: Abutilon striatum, Abutilon Thompsoni, Abutilon venosum, Abutilon insigne, etc. Abutilon avicennæ, known as Velvet-leaf, is a common weed in different parts of the United States. See Plate of Abutilon.

ABUT'MENT (Fr. *aboutir*, to end in, to touch by the extremity, from *bout*, end, compare Engl. *butt*). In architecture, that part of a wall or pier which takes the weight or thrust of the construction above it, as of an arch, vault, or truss. The name is not generally used to designate minor supports, but only those at the end of a series; neither does it refer to vertical, but to diagonal thrusts. An abutment arch is the land arch of a bridge, or any arch in a series that is next to the abutment.

ABÛ-YÛSÛF YAKÛB, ä'bōō-yōō'sụf yä'kụb, called Al-Mansûr, or "The Victorious" (1160-98). The fourth sultan of the Almohade dynasty in Africa and Spain. His father was killed at the siege of Santarem, 1184, and as soon as he had quelled certain insurrections in Morocco, Abû-Yûsûf Yakûb turned his arms against the Christians and carried off to Africa 40,000 captives. In subsequent expeditions he captured Torres and Silves, in Portugal, and defeated the Christians under Alfonso III., near Valencia. He died in Morocco. See Almohades.

Ä'BY, ĕ'bē, Christoph Theodor. See Aeby.

ABY'DOS (Gk. *Ἄβυδος*). In ancient geography, a town of Asia Minor, situated at the narrowest part of the Hellespont, opposite Sestos. It is celebrated as the place where Xerxes and his vast army passed into Europe in 480 B.C.; also as the scene of the story of Hero (q.v.) and Leander. The people of Abydos were proverbial for their effeminate and dissolute manners. There is another Abydos in Upper Egypt (Thebaïs), on the left bank of the Nile and on the main route of commerce with Libya. It is mentioned in the earliest Egyptian inscriptions, and, especially under the nineteenth dynasty, was a city of considerable extent and importance. Later it declined, and in the time of Strabo, about the beginning of the Christian era, it was in ruins. Abydos was celebrated as the burial place of Osiris, and the bodies of pious Egyptians were brought thither for interment from all parts of the land. Magnificent temples, dedicated to Osiris, were built at this place by Seti I. and by his son Rameses II. In the latter temple was found, in 1818, a portion of the famous tablet of Abydos, containing a list of Egyptian kings. The second and more important part of this tablet was found in 1864 in the temple built by Seti I. In recent years excavations conducted at Abydos by Amélineau and Flinders Petrie have brought to light important remains of the first Egyptian dynasty. See Petrie, F., and also Egypt.

ABYDOS, Bride of. A narrative poem in two cantos, by Lord Byron (published 1813). The heroine, Zuleika, is an Oriental character of ideal purity and beauty.

AB'YLA and **CAL'PE**. See Hercules, Pillars of.

ABYS'MAL ACCU'MULA'TIONS. Deposits which gather upon the bottom of the abysmal depths of the ocean. They consist chiefly of red and gray clays, and the so-called oozes, which latter are combinations of the clays with the shells of minute organisms such as Radiolarians, Foraminifera, and Diatoms. For a more detailed description of these abysmal accumulations and other forms of deep-sea deposits the reader is referred to the article on Oceanic Deposit.

ABYSS' (Gk. *ἄβυσσος*, *abyssos*, bottomless, from *ἀ*, *a*, priv. + *βυσσός*, *byssos*, depth, bottom). A designation applied in the Greek translation of the Old Testament to the primitive "chaos" as described in Genesis i : 2. The Hebrew term —*tehôm*—occurs some thirty times, and was modified in the course of time to convey the notion of the "watery deep" in general surrounding the earth, on which, according to what appears to be a later conception, the earth was supposed to rest, and from which springs and rivers were fed. The situation of Sheol being, according to primitive Semitic ideas, in the depths of the earth, the term "abyss" is used in the New Testament (Romans x : 7) as the designation for the abode of the dead, and then more specifically for the prison in which evil powers are confined (so in seven passages of Revelation, ix : 1; xi : 7, etc. See also Luke viii : 31). In the Revised Version of the New Testament, the Greek term is rendered by "abyss," but in the Authorized Version and in both the Authorized and Revised Versions of the Old Testament expressions like "deep" and "bottomless pit" are employed.

ABYS'SAL FAU'NA. See Distribution of Animals.

AB'YSSIN'IA (Ar., from a root connected with Ar. *al-Habash*, "collection, body of men"). A country in East Africa, situated between the Red Sea and the Blue Nile, and extending from about 5° to 15° N. lat., and 36° to 43° E. long. (Map: Africa, H 4). It is bounded by Nubia on the northwest, the Italian colony of Eritrea on the northeast, the country of the Danakil on the east, British East African possessions on the south, and the Egyptian Sudan on the west; but its boundaries can hardly be drawn with precision, on account of the changes caused by foreign treaties and frequent wars between the Negus and the neighboring tribes. It comprises the kingdoms of Tigré, Amhara with Gojam, and Shoa, and the outlying dependencies of Harrar, Kaffa, and Enarea. Its area is estimated at 308,880 square miles, and its population at 8,000,000.

The surface of Abyssinia is a plateau, with an average altitude of about 8000 feet, and a general depression toward Lake Tzana (q.v.) on the west. Of the numerous mountain chains in this region only a few can be clearly traced. The Samen group, situated at the northern end of the country, and inclosed by the bend of the Takazze, has an average altitude of about 10,000 feet and rises in Ras Dashan, over 15,000 feet above the sea. South of the Samen group is another chain, the Talba Wakha, surrounded by the upper course of the Atbara (q.v.) on its emerging from Lake Tzana. This chain is inferior in height to the Samen, its greatest elevation being only about 9000 feet above the sea. The southern part of Abyssinia is less mountainous, but abounds in so-called "ambas," isolated rocky hillocks, most of them very precipitous and difficult of ascent. Although at present it includes no active volcanoes, the country in its entire aspect bears evidence of violent volcanic eruptions in some remote age. Even to-day numerous extinct volcanoes are to be found, with their craters half obliterated, and there are several hot springs in the vicinity of Mount Entoto, some of them with a temperature of 170 degrees.

Among the rivers the most important are the Abai, or Blue Nile (q.v.), the Atbara, or Black Nile, the Takazze, the main head-stream of the latter, and the Hawash. With the exception of the Abai, none of these rivers is navigable, and all are liable to sudden rises, often accompanied by great disasters. The largest lake is Tzana, called also Dembea.

In regard to climate and flora, the country may be divided into three zones. The first, embracing all the districts lying below the altitude of 4800 feet above the sea, and called Kollas, has an annual temperature ranging from 70° to 100° F., and an exceedingly luxuriant vegetation, including cotton, indigo, bananas, sugar cane, coffee, date palms, and ebony. The second zone, Woina Dega, includes all the country between 4800 and 9000 feet above the sea. It is characterized by a moderate temperature, ranging from 60° to 80° F., and its vegetation includes many of the grasses and cereals which flourish in Europe, besides oranges, lemons, olives, tobacco, potatoes, onions, the bamboo, the turpentine tree, etc. The third zone, Dega, which comprises all of the country situated above 9000 feet, has a temperature of 45 to 50 degrees. It affords excellent grazing grounds, and its soil is well adapted for the cultivation of the hardier cereals.

The rainy season on the coast lands lasts from December to May. In the interior of the country there are generally two rainy seasons, one from April to June, and the other from July to October. The climate is generally healthful.

The fauna is not inferior in variety to the flora. It includes, among other animals, the lion, the elephant, the rhinoceros, the giraffe, a species of wolf (the kaberu), the hyena, hippopotamus, zebra, and several forms of antelopes. Consult: Blanford, *Geology and Zoölogy of Abyssinia* (London, 1870). Among the domestic animals may be mentioned the horse, mule, donkey, camel, ox, sheep, and goat.

Geologically the surface of Abyssinia is composed mainly of sandstone, together with granite, basalt, trachyte, and other varieties of igneous rocks. The minerals include gold, which is found mostly in the streams, and also iron, coal, silver, and rock salt. For further information about the geology of Abyssinia, see AFRICA and GREAT RIFT VALLEY.

INDUSTRIES. Abyssinia is preëminently an agricultural country, and its soil is especially well adapted for the cultivation of cereals. The land is divided not among individuals but among families, and the only title to land is its occupation. The agricultural methods employed are of the most primitive kind. Wheat and barley are the chief grains raised. Different kinds of fruit, such as oranges, lemons, bananas, etc., are found in abundance. Cattle raising is a very important industry, and wool is one of the chief articles of export. There are no manufacturing industries.

TRADE. Foreign trade is entirely in the hands of foreign merchants, and is not considerable, as, until recently, the buying was done almost exclusively by the King and his court. The increased security of life and property, however, which the Abyssinians have been enjoying under King Menelek has prompted an increasing number of them to part with their buried treasures of gold and silver in exchange for all kinds of goods. The total value of imports and exports in 1902 was estimated at $3,400,000, the two about balancing each other. Great Britain and the United States are the two leading sources of imports (American cotton textiles are imported annually to the value of about $500,000), and France and Germany come next. The leading articles of import are cotton, silk, and arms. The chief articles of export are coffee, gold, ivory, and skins. Coffee is exported chiefly to Arabia, gold to India. The chief obstacles to trade are the primitive means of communication, resulting in slow and expensive transportation. The distance from Addis Abeba to Harrar, for example, about 250 miles, is traversed in from four to six weeks; the goods are carried on mules' and camels' backs. The railway line between Jibutil, in French Somaliland, and Harrar, which is to be eventually extended to Addis Abeba, will have a total length of about 350 miles, of which about 186 miles were completed and opened for traffic in 1902. This line is constructed entirely by French capital, and is designed to attract the trade between Abyssinia and the coast, passing through Zeila, in British Somaliland. Since 1894 a telegraph line 500 miles long connects Addis Abeba with Massowah.

The chief mediums of exchange are the Maria Theresa dollar and a dollar issued by King Menelek, worth about 50 cents. Salt bars of uniform size and cartridges also circulate to some extent. The Bank of Abyssinia, which was chartered in 1905 and has a capital of £500,000, was granted the privilege of minting the Abyssinian coinage, of issuing legal tender bank notes, and of engaging in all commercial, industrial, and financial transactions. The capital of the bank is mainly provided by the Egyptian National Bank, and it is expected to offset the influence acquired by France through the construction of the railway terminating in Jibutil.

In its form of government Abyssinia may be considered a sort of feudal monarchy. The present King, or Negus, is undoubtedly the real ruler of Abyssinia; but this position he owes more to his personal qualities than to any traditional rights. Certain parts of the country are ruled by petty kings or *ras*, some of them appointed by the Negus, while others are sufficiently strong to defy his authority, and may throw the country into a state of disorder at his death. The petty chiefs have retinues of followers ready to support them in any undertaking so long as there is any prospect of plunder. This class of professional warriors, whose usefulness lasts as long as there are any insubordinate tribes to pacify, is a great hindrance to the development of the country. The revenue is derived from tithes paid in kind, and taxes on commodities, especially gold and ivory sold in the market. The collection of taxes is intrusted to the governors of the villages or *shums*, who are practically unrestricted as to the methods used or amounts collected. The laws of the country are supposed to be derived from the Council of Nicæa. Punishments are of barbaric severity. Blood-feud still prevails. The Abyssinian army, numbering about 150,000, is largely composed of cavalry and is very well adapted for swift movements, as it is not encumbered by any commissariat, its maintenance being obtained from inhabitants of regions through which it passes. This kind of commissariat naturally leaves ample room for abuse and falls most heavily on the agricultural population. The regular army may be supplemented by irregular and provincial troops in case of need.

The political divisions of the country are subject to continual alteration; but the following are the most important: (1) The kingdom of Tigré, extending between the River Takazze or Bahr-el-Aswad (Black River), and the mountains of Samen on one side, and the district of Samhara on the other. Its chief towns are Antalo and Adowa. (2) The kingdom of Amhara, extending on the west of the Takazze and the Samen Mountain, and including Gojam. The capital, Gondar, is situated in the northeast of the plain of Dembea or Gondar, at an elevation of about 7500 feet. (3) The kingdom of Shoa (including Efat), lying southeast of Amhara and separated from the Galla tribes by the Hawash. This is, by all accounts, the best organized and most powerful state now existing in Abyssinia. The capital, Ankobar, at an elevation of about 8000 feet, contains 7000 inhabitants, and enjoys a delightful climate.

The capital of Abyssinia, formerly at Adowa, was transferred after the Italian war to Addis Abeba, which has grown from a village to a city of about 80,000 inhabitants within two to three years. The present residence of Menelek is at Addis Alam, 20 miles west of Addis Abeba.

POPULATION. The location of the people between the Nile and the Red Sea permitted the commingling of Hamites from the north, Himyaritic Semites from Asia, and negroes from the south. The Abyssinians are of medium stature; in color they vary from brunette to translucent black. The principal language of the upper classes is the Amharic, closely allied to the ancient Geez (still used in ritual), and is written in a syllabary resembling that of the old inscriptions in Yemen, Arabia. The Amharic is the language of the court. (See AMHARIC LANGUAGE.) Of the same stock are the Tigré and Tigriña tongues. The language of the common people throughout a great part of the country is the Agua (Agow), a Hamitic tongue. The Gallas, who form an important element in the population, likewise speak a Hamitic language. The Abyssinians are in the hand epoch of the iron age, and are herdsmen. Polygamy prevails extensively. They have little that deserves the name of literature. Education is in the hands of the clergy. The national religion is a perverted Christianity, introduced into the country in the fourth century. The tribe of the Falashas profess Judaism. The Gallas are Mohammedans.

HISTORY. Abyssinia is a part of the ancient and vaguely defined Ethiopia. (For its ancient history, see the article on ETHIOPIA.) The people still call themselves Ethiopians, the name Abyssinians, by which they are generally known outside their own borders, being a Portuguese form of the Arabic *Habsh* or *Habesh*, signifying "mixture," and referring to the diverse tribes which compose the population. The traditions, customs, and language point to an early and intimate intercourse with the Jews; and the Book of Kings professes to record the rulers down from the Queen of Sheba and her son Menelek by Solomon, King of Israel; but this book is not to be depended upon unless corroborated by independent evidence. Greek influence was introduced through an invasion by Ptolemy Euergetes (247-221 B.C.). In the fourth century Christianity was introduced, and Frumentius, who had been instrumental in its introduction, was consecrated as a bishop by Athanasius, patriarch of Alexandria, about 341, and became, as Abuna Salamah ("our father of peace"), the head of the Abyssinian Church, with his seat at Axum, then the capital. The Coptic rite, older than that of Rome or Moscow, has prevailed in Abyssinia to the present day, in spite of efforts to introduce other forms of Christianity made by the Jesuits in the sixteenth century and by representatives of Protestant churches in later years. The head of the Church is still the Abuna, who is sent from Alexandria; but he shares his ecclesiastical authority with the native Echegheh, or head of the monastic bodies. Monasticism of the Oriental type was introduced about the year 470, and became a permanent feature of the life of the country. The monks number about 12,000. In the sixth century the King of the Homerites, an Arab convert to Judaism, began a persecution of the Christians, and King Elesbaas, or Caleb of Axum, invaded Arabia, and conquered Yemen, which was ruled as a province of Abyssinia for sixty-seven years.

This was the most flourishing period of Abyssinia; its influence then reached farthest and it was most in touch with the outside world. In 590, the overthrow of Abrahah, the last Abyssinian ruler of Yemen, left Arabia open for the spread of Mohammedanism, which soon rose like a flood and rolled around Abyssinia, cutting it off from the outside world and from the influences that had been urging it forward. It thus became a primitive, half-barbarous civilization in a state of arrested development. A line of usurpers took the place of the ancient sovereigns in the tenth century and reigned until about 1300. In the reign of Naakweto Laab, the last of this line, Tekla Haimanot, an ardent patriot, who possessed great influence because of the dignity of his character and the unselfishness of his life, succeeded in negotiating a treaty between the King and the representative of the old line, which still held the government of Shoa, by which Naakweto Laab agreed to abdicate, receiving in return a certain mountainous province as a hereditary possession and the right of sitting on the same kind of chair as that used by the sovereign. By the same treaty one-third of the kingdom was granted to the clergy, and it was provided that no native should ever be Abuna, but that the office should be filled by appointees of the patriarch of Alexandria. This was an attempt to renew some connection with the outer world, and shows that the more intelligent Abyssinians keenly felt their isolation. The rise of the Mohammedan power cut Abyssinia off from the coast; the invasion of the rude Gallas from the south in the sixteenth century introduced an alien race into the country, which has always been a harmful and disturbing element. The true Abyssinian type was produced probably by a mingling of the African Hamitic and the Asiatic Semitic stocks, which here came into contact.

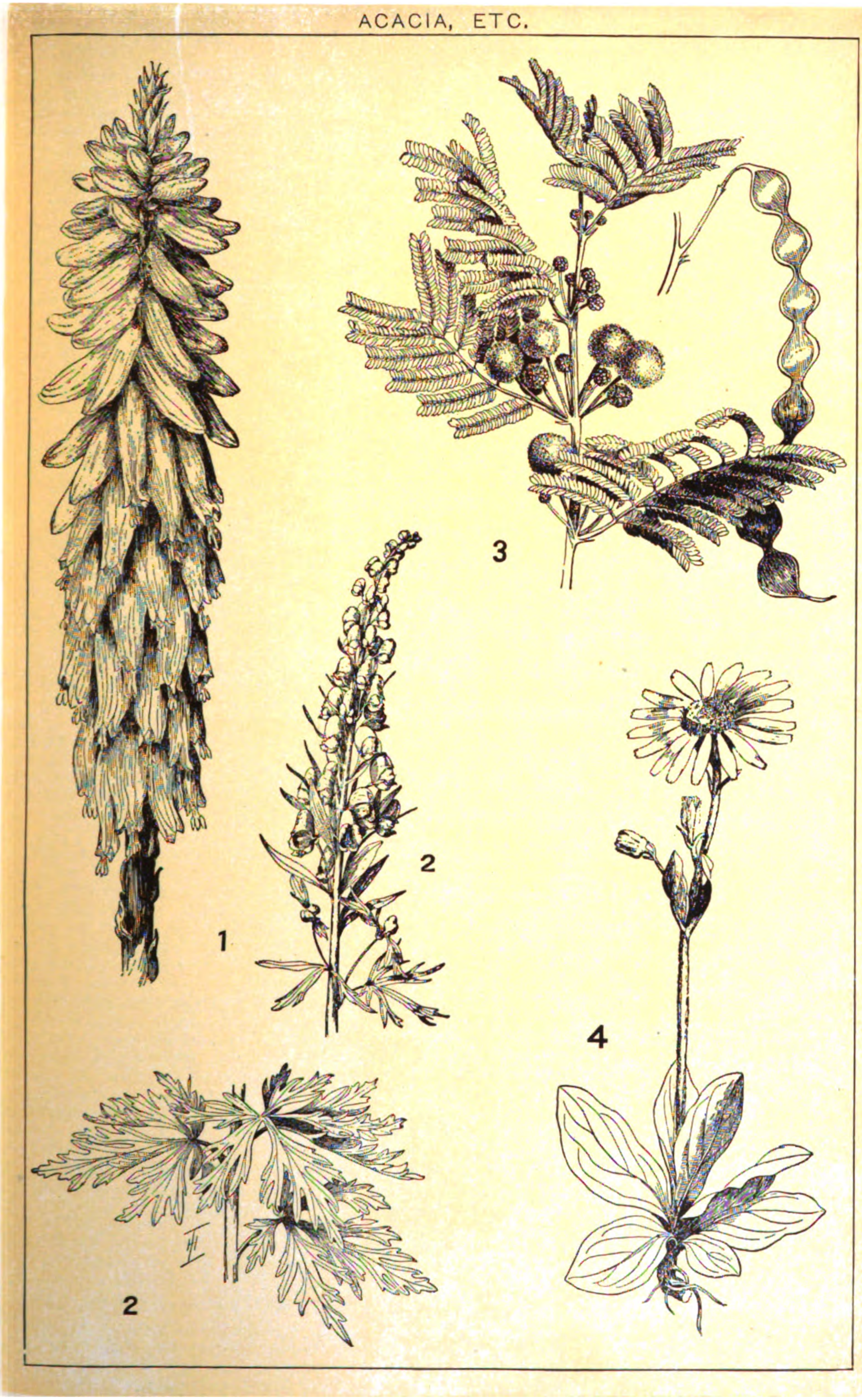
Portuguese Jesuit missionaries came into the country in the sixteenth and seventeenth centuries, and Portugal took much interest in Abyssinian affairs, assisting the Negus against his enemies, the Turks. The attempts of the Jesuits to supplant the old faith with that of Rome was intensely displeasing to the Abyssinians, who have always clung loyally to their national church. The Jesuits were expelled in 1633, and Abyssinia relapsed again into practical isolation until the nineteenth century. Occasional African explorers entered Abyssinia from the fifteenth to the nineteenth century (see Bruce, James), and some remained, voluntarily or constrained by the laws of the country, which at times were hospitable to the admission of travelers, but did not allow their departure. In the middle of the nineteenth century the power was in the hands of Ali, a *ras* or prince of the barbarous Gallas, when it was seized by Lij Kasa, an adventurer who was crowned as Negus with the name of Theodore, in 1854. He was at first very friendly to the English, and acted to a great extent under the advice of the English consul, Mr. Plowden; but meeting difficulties in his task of imposing unity upon the disorganized country, he became morose, and taking offense at the neglect by the English Government of a letter sent by him to Queen Victoria, he imprisoned Mr. Cameron, then British consul, and his suite, and followed this by seizing and holding the members of the mission sent by the British Government under Mr. Rassam to negotiate for freeing the consul. After prolonged and useless attempts at negotiation, an army of English and Indian troops, under Sir Robert Napier, invaded the country, and in a vigorous campaign captured Magdala, Theodore's chief stronghold, and released the prisoners (April 13, 1868). Theodore at once committed suicide. He was succeeded by John, *ras* of Tigré, who proved unequal to the task of quelling rebellion. He fell in 1889 in battle with the dervishes of the Sudan, and Menelek II., *ras* of Shoa, who claims to represent the old line of kings, obtained the crown.

Italy, eager for lands, began to look in this direction as early as 1870, and having occupied several hundred miles of the Red Sea littoral about Massowah (1881-85), it commenced aggressions upon Abyssinian territory, which would have resulted in open war but for the intervention of England, through the friendly mission of Sir Gerald Portal. The Italians claimed a protectorate over Abyssinia by virtue of a clause in the treaty of Uchali (1889), which read differently in the Amharic and Italian versions. Menelek denounced this treaty in 1893, and when the Italians occupied Kassala in the following year, as an outcome of the Anglo-Italian agreement of 1891, defining the spheres of influence of the two nations, Abyssinia renewed hostilities (1895). After sustaining a terrible defeat at Adowa, March 1, 1896, Italy was compelled, in the treaty of Addis Abeba (October 26, 1896), to recognize fully the independence of Abyssinia. In 1897 Great Britain ceded a portion of Somaliland to the Abyssinian government, and in the following year the equatorial province of Kaffa was erected. The boundary towards Eritrea on the north and northeast was fixed by agreement with Italy in 1900 and 1902, and in May of the latter year the boundary between Abyssinia and the Sudan, down to about 6° north latitude, was regulated by agreement with Great Britain, the Emperor agreeing at the same time to permit the construction of a railway through his territories connecting the Sudan and Uganda, a valuable concession in view of the difficulties that would be connected with an attempt to carry the Cape-to-Cairo railway through the swamp lands of the Upper Nile. A treaty of commerce was concluded with the United States in December, 1903 (negotiated by Robert P. Skinner, U. S. Consul at Marseilles), and with Germany in March, 1905.

See Africa, section *History;* Italy. Consult: Wylde, Modern Abyssinia (London, 1891); Vivian, *Abyssinia* (New York, 1901); Portal, *My Mission to Abyssinia* (London, 1892); Rassam, *Narrative of the British Mission to Abyssinia* (London, 1869); Markham, *A History of the Abyssinian Expedition* (London, 1869), containing an excellent summary of Abyssinian history; Vignéras, *Une mission française en Abyssinie* (Paris, 1897); Rohlfs, *Meine Mission nach Abyssinien* (Leipzig, 1883); Stanford's *Compendium of Geography and Travel*, Volume I. (London, 1899); J. T. Bent, *The Sacred City of the Ethiopians* (London, 1893); Welby, *'Twixt Sirdar and Menelek* (London, 1901). *Consul Skinner's Mission to Abyssinia* in *National Geographical Magazine*, vol. xv. (1904); Morié, *Histoire de l'Ethiopie* (Paris, 1904).

AB'YSSIN'IAN CHURCH, The. The Church founded about the middle of the fourth century by Frumentius (q.v.), whose titles Abuna ("our father") and Abba Salamah ("father of peace") are still used by his successors. The abuna, the head of the Church, is never an Abyssinian, and is appointed by the Coptic patriarch of Alexandria. He is bishop of Axum. In Christology the Church is monophysite; the secular priests are allowed to marry once; circumcision, the Sabbath, and the Levirate law are adhered to. Baptism (of adults by trine immersion, infants by aspersion) and the Eucharist (in which grape juice is exclusively used) are accepted; but confirmation, transubstantiation, extreme unction, purgatory, crucifixes, and image worship are all forbidden. There are 180 festivals and 200 fast days. The Scriptures are read in Geez or Ethiopic, which is now a dead language. The attempts of Roman Catholics and Protestants to build up missions among these Christians have not been permanently successful.

ACACIA, ETC.



1. ALOE (Aloe vera).
2. ACONITE (Aconitum napellus).
3. ACACIA (Acacia arabica; var. nilotica).
4. ARNICA (Arnica montana).

ABYSSINIAN MEAD′OW GRASS. See Meadow Grass.

ACA′CIA (literally, thorny, Gk. *ἀκίς*, *akis*, point, splinter, thorn). A genus of plants of the order Leguminosæ, differing from Mimosa in the greater number of stamens (10 to 200) and the absence of transverse partitions in the pods. There are about 450 species of Acacia, 300 of which are indigenous to Australia and Polynesia. The others are found in all tropical and subtropical countries except Europe. The flowers are small and are arranged in globular or elongated clusters. The leaves are usually bipinnately compound; but in many of the Australian species the leaflets are greatly reduced and the leaf blades correspondingly enlarged and flattened into what are termed phyllodia. Most of the species having phyllodia inhabit hot, arid regions, and this modification prevents too rapid evaporation of moisture from the leaves. Many of the species are of great economic importance: some yield gums, others valuable timber, and still others food products. The African species, Acacia gummifera, Acacia seyal, Acacia ehrenbergiana, Acacia tortilis, and Acacia arabica, yield gum arabic, as do the Asiatic species, Acacia arabica and the related Albizzia lebbek. A somewhat similar gum is produced by Acacia decurrens and Acacia dealbata of Australia and Acacia horrida of South Africa. Gum senegal is the product of Acacia verek, sometimes called Acacia senegal. The drug "catechu" is prepared from Acacia catechu. The astringent bark of a number of species is extensively used in tanning, especially the bark of those known in Australia as Wattles. For this purpose Acacia decurrens, the Black Wattle, is one of the best, the air-dried bark of this plant containing about four times as much tanning extract as good oak bark. The most valuable timber tree of the genus is probably the Blackwood (*Acacia melanoxylon*), of Australia. The tree attains a large size, and the wood is easily worked and takes a high polish. A number of the Acacias have been introduced into cultivation in Europe and America, where they thrive. The California experiment station recommends planting several species for tanning extract and for timber. A number of species are grown in mild climates and in greenhouses as ornamentals, partly because of the fragrance of their flowers. The foliage of some of the bipinnate species exhibits sleeping movements analogous to the movements of the sensitive plant. Some species show a remarkable sensitiveness to weather, the leaves remaining closed while the sky is cloudy. The common American Robinia or Locust (*Robinia pseudacacia*) and the Robinia hispida are known as Acacia and Rose Acacia in Europe and elsewhere. Fossil forms of Acacia are abundant in the Tertiary beds of Aix in France, and an allied genus, Acaciæphyllum, has been described from the Cretaceous beds of North America. Consult: F. von Mueller, *Iconography of Australian Acacias* (Melbourne); L. H. Bailey, *Cyclopædia of American Horticulture* (New York, 1900-01); G. Nicholson, *Illustrated Dictionary of Gardening* (London, 1884-89).

ACACIANS, ȧ-kā′shĭ-*anz*. See Acacius.

ACACIUS, ȧ-kā′shĭ-ŭs, Bishop of Cæsarea (340-365). He founded a sect, named after him, which maintained that the Son was *like* the Father; not of the same or of similar substance, but that this likeness was in the will alone. Thus he differed from the general Arian party. His doctrine was actually accepted by a synod at Constantinople, which he manipulated (359), which gave rise to Jerome's famous saying: "The whole world groaned and wondered to find itself Arian." Yet in the end, as formerly, it was condemned, and he was exiled.

AC′ADEM′IC LE′GION. A name applied particularly to an armed body of students who participated in the uprising of 1848 in Vienna; also more generally to similar student companies elsewhere in the revolutionary disturbances of that year.

ACADÉMIE DES BEAUX-ARTS, ȧ′kȧ′dȧ′mẽ′ dȧ bō′zär′. See Ecole des Beaux-Arts.

AC′ADE′MUS (Gk. Ἀκάδημος, *Akadēmos*). A mythical hero of Attica. When the Tyndaridæ invaded the Attic land to rescue Helen from the hands of Theseus, Academus revealed to them the place where their sister was hidden, and in return for this act the Lacedæmonians then and thereafter showed the hero great honor. The Academia was thought to have received its name from Academus, though the earlier form, Hecademia, seems to point to an original Hecademus. The Academia was in early times a sacred precinct, six stades northwest of the Dipylon gate of Athens. Later a gymnasium was built in the precinct, and still later the spot was made a public park, being planted with many kinds of trees, adorned with statues, watered by the Cephissus, and laid out in walks and lawns. Here, in the gymnasium and the neighboring walks, Plato conversed with his pupils and held his first formal lectures in philosophy. Later, having purchased in the neighborhood a piece of land and built thereon a temple to the Muses and a lecture-hall, he transferred his school thither. This spot was also called Academia, and gave its name to the school.

ACAD′EMY (Gk. *ἀκαδήμεια*, *akadēmeia*, or *ἀκαδημία*, *akadēmia*). Originally the name of a public garden outside of Athens, dedicated to Athene and other deities, and containing a grove and a gymnasium. It was popularly believed to have derived its name from its early owner, a certain Academus, an eponymous hero of the Trojan War. It was in these gardens that Plato met and taught his followers, and his school came to be known from their place of meeting as the Academy. The later schools of philosophy which developed from the teachings of Plato down to the time of Cicero were also known as academies. Cicero himself and many of the best authorities following him reckoned but two Academies, the Old, founded by Plato (428-348 B.C.), and including Speusippus, Xenocrates of Chalcedon, Polemo, Crates, and Crantor; and the New, founded by Arcesilaus (241 or 240 B.C.). Others have, however, reckoned the latter as the Middle Academy, and added a third, the New Academy, founded by Carneades (214-129? B.C). Others again have counted no fewer than five, adding to the three above a fourth, that of Philo, and a fifth, that of Antiochus. (See articles Plato; Arcesilaus; Carneades; Philosophy; and references under the last.) From its use in the sense of a school the word academy has come to be applied to certain kinds of institutions of learning; from its use in the sense of a body of learned men it has come to be applied to various associations of scholars, artists, literary men and scientists organized for the promotion of general or special intellectual or artistic interests. Not only was the name applied particularly to the followers of Plato, but it soon came to be given as well to general societies of learned men unconnected with a philosophical school. In the Middle Ages the name and institution survived not merely among the Arabs, particularly in Spain, but, passing over the fable of Alfred's foundation of an academy at Oxford, we find such an institution under the name of academy among the group of scholars whom Charlemagne gathered around him.

At the Renaissance the academy sprang into sudden prominence as a favorite form of intellectual organization, and took its place as an intellectual force beside the universities. From these it differed, as it does to-day, in being not a teaching body but a group of investigators, who, generally under royal or state patronage, encouraged learning, literature, and art by research and publication. Laying aside the claims of Alost to a society of scholars in 1107, and that of Diest to a society of poets in 1302, academies of this type seem to have first appeared in Italy and to have been devoted to literature, art, and architecture. The Academy of Fine Arts, founded at Florence about 1270 by Brunetto Latini; that of Palermo, about 1300, by Frederick II.; and the Academy of Architecture of Milan (1380?) were among the first of these. Language and literature were not far behind. The so-called Academy of Floral Games (Académie des Jeux Floraux), founded at Toulouse about 1325 by one Clemens Isaurus as a part of the great Troubadour movement, was probably the earliest of these literary academies, and has had an almost continuous history till the present day. With this exception the earliest academies rose in Italy, and found their prototype in that brilliant group of scholars, critics, and literati gathered at the court of Lorenzo de' Medici, the Magnificent, and Cosmo de' Medici in Florence, the so-called Platonic Academy which, founded about 1474, was dissolved in 1521. It was succeeded in Florence by the Academy of Florence, formed in 1540 especially for the study of Tuscan, particularly Petrarch. Before the Platonic Academy of the Medici only Naples boasts an earlier academy, that founded about 1440 by Alfonso V. But the sixteenth century was rich in academies devoted to literature. The Intronati of Siena, 1525; the Infiammati of Padua, 1534; the Rozzi of Siena, later suppressed by Cosmo de' Medici, 1568; and the Accademia della Crusca or Furfuratorum, founded in 1582 and still in existence, the most famous of them all, are perhaps the best known of that astonishing burst of academic vigor which produced in the sixteenth century in Italy a number variously estimated from 170 to 700 of this form of organization. In these, under curious names but with common purpose, the Italian aristocracy especially, barred from political interests by tyrants and republics alike, found vent for their activity.

One academy of distinction alone devoted to science appears in this period, the Academia Secretorum Naturæ, founded at Naples in 1560, and after a short existence suppressed by the Church. It was succeeded by the Accademia de' Lincei, founded by Prince Chesi in 1603, counting Galileo among its members, and still existing in Rome after many changes. The foundation of this society heralded that great burst of interest in sciences of the seventeenth and eighteenth centuries which to some extent succeeded the purely literary activity of the sixteenth. The Reformation had destroyed or altered much of the ecclesiastical power which had served to check investigation earlier, and the foundation of several societies indicated a new interest in science. Of these the Academia Naturæ Curiosorum, Leipzig, established by Dr. J. L. Bausch in 1651-52, still exists under the name of Cæsareo-Leopoldinia, in honor of the Emperor Leopold I., who patronized it liberally. Since 1808 it has had its headquarters at Bonn. The Royal Society (q.v.) in England, the Academy of Sciences in Paris, the Academy or Collegium Curiosum established by Professor Sturm of the University of Altdorf, and similar institutions brought about an astonishing increase of interest and consequent advance in scientific pursuits and methods. The importance of these academies to science indeed can hardly be overestimated.

This was maintained in the eighteenth century, and the establishment of academies was further stimulated then by the influence of Louis XIV., so important in this as in so many other intellectual as well as political interests throughout Europe. In this, however, as in so many other ways, he and his ministers but carried further the plans of their predecessors. In 1635 Richelieu established the most famous of all such organizations, the old French Academy, which had its inception six years before in the minds of eight men of letters. It consisted of forty members, with a director, a chancellor, and a secretary, and its avowed purpose was to control the French language and regulate literary taste. Its constitution provided for the publication of a grammar, a treatise on rhetoric, and one on poetry, besides a dictionary of the French language. Though its condition has been somewhat changed, it is the same in all essentials to-day as it was at its foundation. In this plan Richelieu was copied, as usual, by his successor, Mazarin, who established the Academy of Painting and Sculpture (the present Academy of Fine Arts) in 1648. It was opened in 1664 by Colbert who founded in 1671 the Academy of Architecture, later merged into the Academy of Fine Arts. Colbert also founded the Academy of Inscriptions and Belles Lettres in 1663, as a committee of the old academy to draw up inscriptions for monuments and medals to commemorate the victories and glories of Louis XIV., the Academy of Sciences in 1666, and the Academy of France at Rome. The Academy of Inscriptions was remodeled in 1706. All these, save the last, together with the Academy of Moral and Political Science, founded in 1832, came to form the Institute of France (q.v.). To Louis XIV. other cities in France owed the charters of their academies, notably Montpellier in 1706.

Largely owing to these two causes, that is to say, the interest in science and the fashion of royal patronage set by Louis XIV., the foundation of academies reached its height in the eighteenth century, especially in Germany and the north and east of Europe. Frederick I. of Prussia founded the Royal Academy of Sciences in Berlin in 1700, on a plan drawn up by Leibnitz, its first president. That savant aided also in drawing up the scheme adopted by Peter the Great and carried out by Catharine I. in the foundation of the Imperial Academy of Sciences at St. Petersburg in 1725. In 1739 the Academy of Sciences of Stockholm was established with a most distinguished member in Linnæus, and was incorporated in 1741 as the Royal Swedish Academy. In 1742 Christian VI. founded the Royal Academy of Copenhagen; in 1750-51 the Göttingen Academy of Sciences was established; in 1754 the Electoral Academy at Erfurt; in 1755 the Academy of Sciences of Mannheim was founded by the Elector Palatine, Karl Theodor, and in 1759 the Electoral Bavarian Academy of Sciences was founded at Munich. In Italy the Royal Academy of Sciences of Turin originated in 1757 as a private society, receiving royal recognition in 1783. Not merely were academies founded in the broad field of science, in its earlier sense of all human knowledge, they were established for all imaginable special purposes. In surgery, the Surgical Academy of Paris, 1731, and the so-called Academy of Surgery at Vienna, more properly a college, are the most prominent examples. In archæology and history we find the Royal Academy of History established at Madrid in 1738, the Archæological Academy of Upsala founded in 1710, that of Cortona in 1727, and that of Herculaneum at Naples in 1755. In literature the Royal Spanish Academy, founded by the exertions of the Duke d'Escalona in 1713 or 1714, and the Royal Academy of Savoy, founded in 1719 by Charles Felix, are the most prominent of numerous similar institutions, including those of St. Petersburg of 1783, later a part of the Imperial Academy, and Stockholm in 1786. In music and the fine arts, the departments to which the name has been especially applied in England, the Royal Academy of Arts was founded in 1768, with Sir Joshua Reynolds as its first president, the Academy of Arts at Milan, that of painting and sculpture and architecture at Madrid by Philip V., the Swedish Academy of Fine Arts by Count Tessin in 1733, and the Academy of Painting and Sculpture at Turin in 1778.

During the nineteenth century a smaller number of such organizations were founded, partly because the field was so well covered, partly because other forms of activity or the same form of institution under a different name took its place. (See SOCIETIES; ADVANCEMENT OF SCIENCE, ASSOCIATIONS FOR THE.) The Royal Hibernian Academy, founded in 1803, the English Royal Academy of Music, founded in 1822 and incorporated in 1830, and the Royal Scottish Academy, founded in 1826 and chartered in 1838, represent the English activities in this field. The Philadelphia Academy of Sciences, founded in 1812 and incorporated in 1817, and the Vienna Academy of Sciences, founded in 1846, are among the most important scientific foundations of the century. The Celtic Academy of Paris, founded 1800 to 1805 and merged in 1813 into the Society of Antiquaries of France, and the Academy of History and Antiquities of Naples, founded by Joseph Bonaparte, represent the Napoleonic period. The Academy of Medicine of Paris, founded for research into matters affecting public health, 1820, has performed excellent service to the community at large. But the most important event in academic organization of the century was the reorganization of the French Academy into the Institute of France, an account of which may be found under that title in this work. The French Academy as now constituted represents the old academy of Richelieu, though it is reckoned officially as the highest of the five divisions of the Institute. Its membership in 1906 was as follows, in order of seniority:

Émile Ollivier
Alfred Mézières
Gaston Boissier
Victorien Sardou
A. J. E. Rousse
R. F. A. Sully-Prudhomme
François Coppée
Ludovic Halévy
Comte Othénin d'Haussonville
Jules Claretie
Vicomte E. M. Melchior de Vogüé
Charles de Freycinet
Julien Viaud (Pierre Loti)
Ernest Lavisse
Paul Thureau-Dangin
Ferdinand Brunetière
Albert Sorel
Paul Bourget
Henri Houssaye
Jules Lemaître
Anatole France
Marquis Costa de Beauregard
André Theuriet
Comte Albert Vandal
Comte Albert de Mun
Gabriel Hanotaux
H. E. L. Lavedan
P. E. L. Deschanel
Paul Hervieu
Émile Faguet
Marcellin Berthelot
Marquis C. J. Melchior de Vogüé
Edmond Rostand
Frédéric Masson
René Bazin
Émile Gebhart
Etienne Lamy
Maurice Barrès
Alexandre Ribot
Cardinal Mathieu (ex-archbishop of Toulouse)

It remains to notice in detail some of the other more important existing academies. The Royal Academy, Burlington House, London, the association of English artists, holds an exhibition each year, open to all artists, and corresponding to the French Salon. It consisted in 1906 of 40 Academicians (R. A.) and 28 Associates (A. R. A.), the prescribed number being 30. Sir Edward John Poynter has been its president since 1896. In 1902 the British Academy for the promotion of Historical, Philosophical, and Philological Studies was founded at London. Its maximum membership is 100, and it is divided into four sections—history and archæology, philology, philosophy, jurisprudence and economics. The Royal Academy of Sciences at Berlin, founded in 1700, owes its present statutes to the year 1881. It consists of two sections—physics-mathematics and philosophy-history. It has 60 regular and 20 foreign, corresponding, and honorary members. Its publications have appeared since its foundation. The Imperial Academy of St. Petersburg, founded in 1725, has three divisions—physics-mathematics, Russian language and literature, history-philology. It is richly endowed, and offers yearly prizes for contributions to learning. Its library is very large, and it controls a number of museums. The Royal Swedish Academy of Sciences, founded in 1739, has 100 native and 75 foreign members, and its work is divided into nine classes. The Royal Bavarian Academy includes theology, law, finance, and medicine among its activities, and has three classes—philosophy-philology, mathematics-physics, and history. The Imperial Academy of Sciences of Vienna, founded in 1846, comprises two classes — philosophy-history and mathematics-science—with frequent meetings, and its publications are especially numerous and important. It is well endowed by private benefaction, and by the State, and is enabled to send out many scientific expeditions.

In the United States there are many such societies. The earliest founded was the American Philosophical Society, organized in 1743 through the efforts of Benjamin Franklin, who was its first secretary, and later, until his death, its president. The interests and the activities of this society covered the whole range of science pure and applied, and of philosophy. The publication of *Transactions* began in 1771 and of its *Proceedings* in 1838. At present the society has

200 resident and 300 non-resident members. The American Academy of Arts and Sciences was chartered by the Legislature of Massachusetts in 1780, to a considerable extent through the influence of John Adams. Its attention was devoted to the study of the antiquities and the natural history of America. It has published a series of memoirs, beginning in 1785, and *Proceedings* since 1846. The Connecticut Academy of Arts and Sciences was founded in 1799, and the Philadelphia Academy of Natural Science in 1812. This latter academy has a very valuable library and museum, especially rich in conchology and ornithology, and has published *Journals* since 1817 and *Proceedings* since 1841, besides the *American Journal of Conchology*. The New York Academy of Science was founded in 1818 as the Lyceum of Natural History, and received its present title in 1875. It is organized into four sections, as follows: Astronomy and physics, geology and mineralogy, biology, and anthropology, psychology, and philology. These sections hold monthly meetings, and the Academy holds general meetings and gives an annual exhibit of scientific progress that is of great value. Similar scientific academies have been organized in most of the large cities in the United States, but their influence is chiefly local. Such societies usually cover the entire field of the exact and the natural sciences, while special societies for particular sciences are now commonly formed. In recent years Washington is becoming the centre of scientific interest in this country, and in 1898 its various scientific societies combined into the Washington Academy of Science. National associations of the same character have been formed. In 1863 Congress chartered the National Academy of Sciences, which was designed to investigate scientific questions and to report thereon to the Government. As a matter of fact, however, the Academy has not been frequently employed by the Government. Two annual meetings are held and reports and memoirs are issued. The membership of the Academy originally was limited to 50 members but in 1870 this limitation was removed, and now five members may be elected annually. At present there are 86 members. The American Association for the Advancement of Science was organized in 1848 and is the most active and the largest of such associations. It now has about 1000 members and 776 fellows, the latter being those who are engaged in advancing science, while any one interested in science may be a member. In fine arts both Philadelphia and New York possess institutions under the name of academies, founded in 1805 and 1828 respectively, each having schools of design and annual exhibitions. Many other such associations, under different names, are to be found in this country for the prosecution of research and publication along literary as well as scientific lines. Of these last the American Academy of Political and Social Science of Philadelphia is perhaps the most important. It was founded in 1889, has a large membership, and its publications, under the title of *Annals*, are of considerable value. See SMITHSONIAN INSTITUTION.

In the sense of a school or an institution of learning, the term academy has come to be applied to an educational institution between the elementary school and the college, particularly in the eastern part of the United States, though used occasionally elsewhere. In his *Tractate on Education*, John Milton calls his ideal educational institution an academy. In England the term applied to those institutions of secondary rank established by the dissenting religious bodies during the latter part of the seventeenth and in the eighteenth century to provide for the general education of their youth, especially those intended for the ministry, since such education could not be obtained from the existing public schools. In the United States the term was first applied to the institution founded in Philadelphia in 1749 under the leadership of Benjamin Franklin. This Academy and College of Philadelphia was chartered in 1753, and became the University of Pennsylvania in 1779. The typical academies were those founded during the Revolutionary War period at Exeter, N. H., and Andover, Mass., largely through the generosity of John Phillips, after whom they are named. Such academies became very numerous and took the place of the old Latin grammar schools, which had lost their popularity and serviceableness on account of the economic and political changes of the eighteenth century. Such academies are controlled by trustees usually of some one religious denomination, and are not dependent upon state support. Their place has been largely taken up by the modern high school; the existing ones have for the most part become college preparatory schools.

The term is also used much more widely in a lower sense, to indicate places where special accomplishments are taught, such as riding, dancing, or fencing academies. A more restricted use is that in connection with schools that prepare for particular professions, as the United States Military Academy at West Point. In France and the United States it is occasionally applied to buildings devoted to particular arts, especially music; hence an opera house, often called an academy of music; and occasionally by analogy to the theatre as well.

ACAD′EMY OF DESIGN′, NATIONAL. See NATIONAL ACADEMY OF DESIGN.

ACA′DIA (Fr. *Acadie*, *L'Acadie*, or *La Cadie*, from the Micmac Indian word *ăkădē*, meaning abundance). See NOVA SCOTIA.

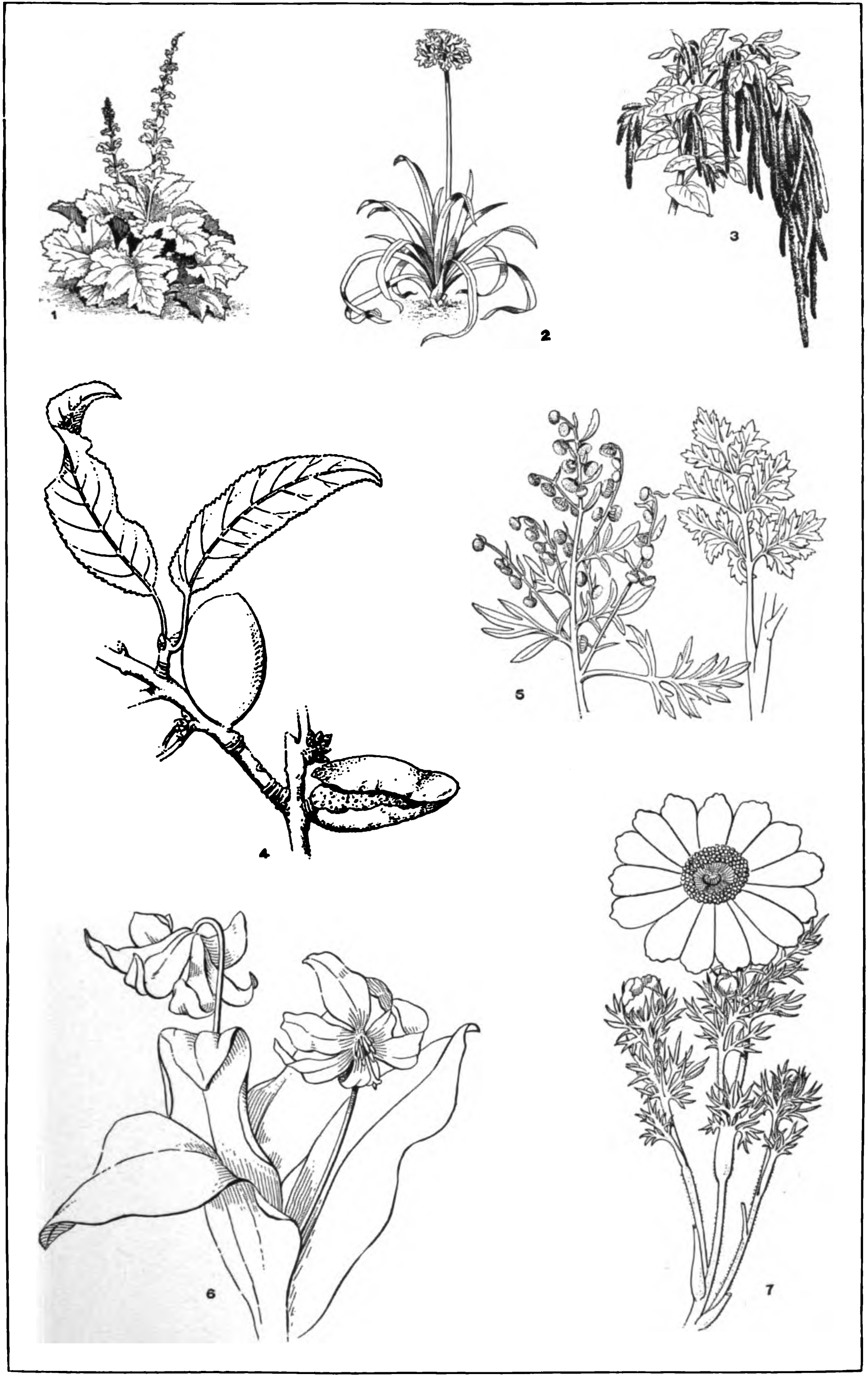
ACA′DIAN SE′RIES. See CAMBRIAN SYSTEM.

ACAJUTLA, ä′kȧ-hōōt′lȧ. A seaport in the Department of Sansonate, Republic of Salvador, Central America, situated on the Pacific Ocean, 10 miles south of Sansonate (Map: Central America, C 4). It is the second port of Salvador in importance, and the seat of a consular agent of the United States.

AC′ALE′PHÆ (plural of Gk. ἀκαλήφη, *akalēphē*, a nettle, a kind of jellyfish). A group of free-swimming, discoidal or bell-shaped medusæ, the lobed jellyfishes, with downwardly directed mouth, gastro-vascular pouches, and numerous radial canals, and having, as a rule, the margin of the umbrella lobed; called Discophora by Huxley. See JELLYFISH.

ACAMAPICTLI, ȧ-kȧ-mȧ-pĕsh′tlė, or **ACAMPICHTLI**, or **ACAMAPIXTLE** ("the hand full of reeds"). An Aztec chieftain or king. The dates of his reign are variously given as 1352-89, 1363-96, and 1375-1403. He was a vassal of the King of the Tepanecs, and ruled but a small territory, yet he maintained peace, began the construction of the canals of Lake Tezcoco,

ACANTHUS, ETC.



1. ACANTHUS (Acanthus mollis, var. latifolius).
2. AFRICAN LILY (Agapantus umbellatus).
3. LOVE-LIES-BLEEDING (Amaranthus caudatus).
4. ALMOND (Prunus Persica).
5. WORMWOOD (Artemisia Absinthium).
6. ROCKY MOUNTAIN ADDER'S TONGUE (Erythronium grandiflorum).
7. PHEASANT'S EYE (Adonis autumnalis).

and built many stone edifices in his capital of Tenochtitlan.

AC'ANTHA'CEÆ (for derivation see ACANTHUS). An order of dicotyledonous plants embracing about 130 genera and 1600 species. It is found chiefly in the tropics, but also occurs in the south of Europe and the United States. The species are mostly herbs and shrubs, although a few become trees. Plants of this order frequent almost every situation, from marshes to the driest of conditions where plants are able to survive. The leaves are usually thin and entire. The flower parts in fours or fives, stamens often two and styles two. The fruit is a two-celled capsule, upon the explosion of which the seeds are thrown out, aided by peculiar outgrowths from the base of their stalks. The chief genera are Nelsonia, Thunbergia, Strobilanthus, Ruellia, Blepharis, Acanthus, and Justicia.

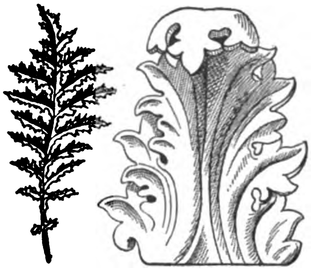
ACAN'THITE (Gk. ἄκανθα, *akantha*, thorn). A silver sulphide that crystallizes in the orthorhombic system. It is iron-black in color, and has a metallic lustre. It occurs with argentite and stephanite at various localities near Freiberg in Saxony, and is named from the peculiar shape of its crystals.

ACAN'THOCEPH'ALA (Gk. ἄκανθα, *akantha*, thorn, prickle + κεφαλή, *kephalē*, head). An order of round parasitic worms distinguished by an elongated cylindrical body and a proboscis armed with horny hooks. The order contains three families, viz., Gigantorhynchidæ, Neorhynchidæ, and Echinorhynchidæ. Echinorhynchus gigas is parasitic in the small intestine of swine. Other species are found in ducks and other aquatic birds. The Acanthocephala belong to the class Nemathelminthes, which includes also the Gordiaceæ and the Nematodes.

ACANTHOPTERYGII, ăk'ȧn-thŏp-tēr-ĭj'ĭ-ī (Gk. ἄκανθα, *akantha*, thorn + πτερύγιον, *pterygion*, wing; plural, fins). One of the primary divisions of the osseous fishes (Teleostei). It includes many families, among which are largely the most specialized forms of fishes. They are characterized by the possession of spines in the anterior portion of the dorsal fin or in the first dorsal when two are present, and by the usual absence of a pneumatic duct connecting the air-bladder with the œsophagus. The ventral fins are generally thoracic, i.e., fastened to the shoulder. The acanthopterygian fishes include the perch, bass, mackerel, and similar forms.

ACAN'THUS (Lat., from Gk. ἄκανθος, *akanthos*, brankursine). A name given by the Greeks and Romans to certain plants of the natural order Acanthaceæ, which order contains nearly 134 genera and 1600 species. The plants of the order are herbs or shrubs, rarely trees, chiefly tropical, a few occurring in the Mediterranean region, in the United States, and in Australia. The greater number are mere weeds, but the genera Justicia, Aphelandra, and Ruellia contain some of our finest hothouse flowers. In cultivation the Acanthus is only semi-hardy, and needs protection in England and in the United States north of Virginia. Of a dozen varieties of the genus Acanthus two only were anciently common in Mediterranean lands: the wild Acanthus (*Acanthus spinosus*), a short prickly plant with curly leaves; and the cultivated Acanthus (*Acanthus mollis*), with larger, thicker, smooth leaves without thorns. See Plate of ACANTHUS, ETC.

IN ARCHITECTURE. The leaves of both of these varieties have been copied in architectural decoration. Those of Acanthus spinosus only were conventionalized by the Greeks in the Corinthian capital (q.v.), whose characteristic decorations they formed, as well as in other details, such as the acroterion (q.v.) of temples, monuments, or sepulchral columns, etc. In all these Grecian decorations the acanthus leaves are straight and pointed. Etruscan and early Roman works show a form of acanthus with curling, split leaves of quite different aspect. The typical Greek three-lobed acanthus was introduced into Roman architecture before the close of the Republic, but the Roman artists of the time of the Empire were not satisfied with its simple forms; they conventionalized it, adopted in preference the form of the more luxuriant Acanthus mollis, and combined with it the forms of other trees and plants, especially the olive, laurel, and parsley. The result was an extremely rich decoration of capitals, friezes, consoles, moldings, and cornices quite unknown to Greek art. The acanthus came into use also in other forms of decoration: in fresco painting, in the ornamentation of table feet, of vases, candelabra, furniture, goldsmith work, and embroideries. It naturally passed into post-classical ornament, together with the Corinthian capital, which was the favorite form, and we find it in early Christian, Byzantine, and Romanesque art. In certain parts of Italy it preserved its purity until the Renaissance — especially in central and southern Italy—and in southern and central France it was superseded only by Gothic foliage. See COLUMN.



ACANTHUS.

A CAPELLA, ä kȧ-pĕl'lȧ (Ital., in the church style). Music for voices without accompaniment, like the early church compositions. The term is also used when the accompaniment is octaves or unison. As an indication of time it is equivalent to *alla breve* (q.v.).

A CAPRICCIO, ä kȧ-prē'chō (Ital.). At the caprice or pleasure of the performer, regarding both time and expression. A musical term.

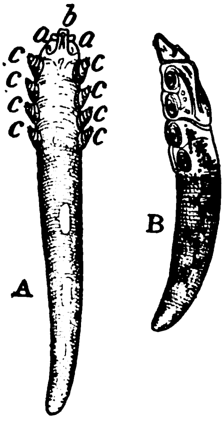
ACAPULCO, ä'kȧ-pōōl'kō (a corrupted abbreviation of the Latin name [*Portus*] *Acquæ Pulchræ*, [Port of] beautiful water). A town on the Pacific coast, in Guerrero, Mexico, 231 miles southwest of the City of Mexico, of which it was formerly the Pacific port, on account of the excellence of its harbor (Map: Mexico, J 9). It was the chief centre of commerce with the Philippine Islands, as well as China and India, until the railroad between the City of Mexico and San Blas robbed it of most of its trade. Population, 1900, 4932.

AC'ARI'ASIS. See MANGE.

AC'ARI'NA. See MITES.

AC'ARNA'NIA (Gk. 'Ακαρνανία, *Akarnania)*. A country of ancient Greece, separated from Epirus on the north by the Ambracian Gulf, now the Gulf of Arta, from Ætolia on the east by the River Achelоüs, and washed south and west by the Ionian Sea. Along with Ætolia, it forms one of the nomes or departments of the modern kingdom of Greece, with an area of 3013 square miles and a population of 170,565 in 1896. The western part of Acarnania—from the mouth of the Achelоüs or Aspropotamo to Cape Actium in the northwest—is occupied by a mass of rocky and thickly-wooded mountains, rising abruptly from the indented coast and culminating in the summit of Berganti. A considerable part of Acarnania is overgrown with wood—a rare feature in modern Greece. There is no town of importance in the whole district, though naturally the territory is not destitute of resources. Consult Oberhummer, *Akarnanien, Ambrakia, Amphilochien, Leukas im Altertum* (Munich, 1887).

AC'ARUS FOLLIC'ULO'RUM, or *Demodex*, or *Steatozoön folliculorum*, the comedo mite. A microscopic parasite residing in the sebaceous sacs and hair follicles of the human skin. It was first described by Dr. Simon of Berlin in 1842, under the title of Acarus folliculorum, which was suggested by the eminent zoölogist, Erichson of Berlin. According to Professor Owen, who gave it the name of Demodex, it represents the lowest form of the class Arachnida, and makes a transition from the Annelids to the higher Articulata. Their presence has no reference to disease of the skin or of the follicles. They are met with in almost every person. They vary in length from $\frac{1}{50}$th to $\frac{1}{100}$th of an inch, and the accompanying figure represents the magnified parasite. Their number is various; in some persons not more than two or three can be found in a follicle, while in others upward of fifteen. The head is always directed inward. They are most commonly found in the skin of the face, particularly that of the nose; but they have also been met with in the follicles of the back, the breast, and the abdomen. The animal possesses eight thoracic appendages (*c, c*) of the most rudimentary kind, each of which is terminated by three short setæ. The integument of the abdomen is very finely annulated. The mouth is suctorial or proboscidiform, consisting of two small spine-shaped maxillæ (*b*), and an extensive labium capable of being elongated or retracted; it is provided on each side with a short, thick, maxillary palp (*a, a*), consisting of two joints with a narrow, triangular labrum above. The sexes are distinct, but the differences between the male and female are not well recognized. Ova are frequently seen, both in the body of the female and in detached discharged masses. Acari may be examined by collecting between two pieces of thin glass the expressed fatty matter from a nasal follicle and moistening it with a drop of olive oil before placing under a microscope lens of 300 diameters. Identical animals have been found in the skin of dogs, hogs, and cattle. They damage cowhides in some instances. No treatment is requisite.



(A) ACARUS FOLLICULORUM.
(B) DEMODEX MORNINIS.

ACASTE, à'kȧst'. One of the characters in Molière's *Misanthrope* (q.v.); a self-satisfied young marquis who easily consoles himself when scorned as a suitor by Célimène.

ACASTO, ȧ-käs'tō. In Otway's tragedy of *The Orphan* (q.v.), a nobleman retired from the court who is the guardian of Monimia, the heroine, and father of Castalio and Polydore.

ACAS'TUS (Gk. 'Ακαστος, *Akastos*). A son of Pelias, King of Iolcus; one of the Argonauts and of the Calydonian hunters. He revenged the murder of his father (killed by his daughters at the instigation of Medea) by driving Jason and Medea out of Iolcus. See ARGONAUTS; MEDEA.

AC'ATHIS'TUS (Gk. ἀ, *a* priv. + καθίζειν, *kathizein*, to sit down). A hymn in honor of the Virgin, sung standing in the Greek Church on Saturday of the fifth week in Lent, when the repulse of the Avars from Constantinople is celebrated.

AC'CAD. One of the chief cities of the land of Shinar (i.e., Babylonia), mentioned in Genesis x : 10. Originally applied to a city only, the name was afterward extended to the district of which Accad (or Akkad) was at one time the centre, and among the titles of the kings of Babylonia and Assyria we find, from about 3000 B.C. on, the phrase "King of the land of Shumer (the biblical Shinar) and Akkad" used as a designation for all Babylonia. If the identification of Accad with the city of Agade, mentioned in the inscriptions of Sargon I. and of his son, Naram-sin, were certain, we could place this ancient city of Akkad about fifteen miles west of Bagdad. According to the testimony of Nabonidus, the last ruler of Babylonia, Sargon I., whose seat was at Agade, ruled about 3800 B.C., but the statement of Nabonidus is open to suspicion as overstating the length of time between him and Sargon, and the identification of Akkad with Agade is not certain. The city of Accad was still in existence in the days of Nebuchadnezzar I. (circa 1135 B.C.), who makes mention of it in an inscription. The Accadians belonged to the white race, and were probably Semites, the theory of an Accadian-Sumerian language of Turanian, or Uralo-Altaic, affinities having been abandoned by the best authorities. Whether they were the first inhabitants of the country, in which they are found so early, may be doubted; but their predecessors, if any, were of the white race, possibly Aryans, or, it may be, peoples akin to the tribes of the Caucasus. Indeed, the Accadians themselves may have been in part Aryan. Consult Robert William Rogers, *History of Babylonia and Assyria* (2 vols., New York, 1900). See the articles ASSYRIA; BABYLONIA; SUMERIAN LANGUAGE.

AC'CA LAREN'TIA. In the story of primitive Rome, the wife of the king's shepherd, Faustulus, who found the twin infants, Romulus and Remus, and carried them to her to be nursed and brought up. But this is a later legend. The name Acca Larentia seems to have meant "Mother of the *Lares;*" and in the primitive Latin mythology she was the cultus-heroine of the festival Larentalia, held in honor of the spirits of the dead on December 23. She was perhaps identical with Dea Dia, to whose worship the Fratres Arvales were dedicated. See ARVAL BROTHERS.

ACCAULT, ȧ'kō', MICHEL. A French explorer. He was a lieutenant of La Salle, at whose request he accompanied Louis Hennepin in the exploration of the upper part of the Mississippi in 1679. See HENNEPIN.

AC'CELERAN'DO, *Ital. pron.* ä'chȧ-lȧ-rän'dō. In music, with gradually increasing velocity of movement.

ACCEL'ERA'TION (from Lat. *ad,* to + *celerare,* to hasten). In theoretical mechanics, a term which denotes the rate of change of velocity at any instant with respect to the time, that is, the change of velocity in the next second of time if the rate of change is uniform; in other words, the change which would take place in the velocity in the next second if, during that time, the change were to continue at the same rate as at the instant considered. An example of acceleration is furnished by a body falling freely toward the earth. Its numerical value is about 981 centimeters, or 32.2 feet, per second in one second. Hence a body freely falling from a position of rest, or with velocity equal to zero, at the end of the first second would be moving with a velocity of 32 feet per second, at the end of the second second with a velocity of 64, at the end of the third second with a velocity of 96, and so on. In mathematical language, the acceleration is the limiting value of the ratio $\Delta v/\Delta t$, where Δv is the actual change in the velocity in the interval of time Δt seconds, as this interval is taken shorter and shorter. There are two kinds of acceleration, linear and angular, corresponding to the two kinds of motion, translation and rotation, and there are two types of each of these. See MECHANICS.

AC'CENT (Lat. *accentus,* from *ad,* to + *cantus,* singing, chant). A special stress laid upon one syllable of a word, by which it is made more prominent than the rest. In the Indo-European languages two kinds of accent are found, varying in quality—the musical and the expiratory. The first is found in Sanskrit and Greek, the second in Latin and Teutonic. The accent may also be distinguished by its position, as free, in Greek and primitive Teutonic, and fixed, in later Teutonic. In English the general tendency is to throw the accent back. In compound words the accent is usually on the first part, as in *courtyard, highway.* When the first part is a prefix it receives the accent if the word be a noun or adjective; the root is accented if the word be a verb. This rule applies also to some other words, as pres'ent and present'. Borrowed words usually adopt the English accent, as *orator, presence;* but some recently borrowed French words retain the original accentuation, as *parole, caprice.* The absence of stress on final inflectional syllables has played an important part in the leveling of inflections. (See ENGLISH LANGUAGE.) Besides word-accents, there is a sentence-accent, by which some word in the sentence is given greater stress than the others. This is always a free accent, the position of the accent depending upon the meaning. In the sentence, "Where is he?" three different meanings can be given by shifting the position of the accent. The effect of sentence accent is often seen in the development of doublets, or words with a common origin, but a different form and meaning, as to—too, of—off. (See PHONETIC LAWS.) Accent is also the essential principle of modern verse. (See VERSIFICATION.) For the primitive Indo-European accent and its effect in connection with conjugation, see PHILOLOGY.

IN MUSIC, the term is analogous to accent in language, the stress or emphasis given to certain notes or parts of bars in a composition. It may be of three kinds: grammatical, rhythmical, and rhetorical or æsthetic. The first always falls on the first part of a bar, long or compound measures of time usually having additional or subordinate accents—only slightly marked. The rhythmical accent is applied to the larger component parts of a composition, such as phrases, themes, motives, etc., and marks their entrance, climax, end. The rhetorical accent is irregular, and depends on taste and feeling, exactly as do the accent and emphasis used in oratory. In vocal music well adapted to words, the words serve as a guide to the right use of the rhetorical accent. See SYNCOPATION; RAGTIME.

ACCEN'TOR (Lat., one who sings with another, from *ad,* to + *cantor,* singer). A book name for a group of European warblers, of which the misnamed British hedge-sparrow (*Accentor modularis*) is a type; and also for the American water-thrushes, wood-warblers of the genus *Seiurus.*

ACCEPT'ANCE. In law, the signification by the drawee of his assent to the order of the drawer of a bill of exchange (q.v.). The term is also employed to describe the bill after such acceptance.

ACCEPT'ANTS, APPEL'LANTS. The names given, respectively, to those among the French clergy who accepted the bull *Unigenitus* condemning Jansenism (1713), and to those who did not, but appealed to a general council to settle the controversy.

AC'CESS, RIGHT OF. A legal incident of the ownership of property abutting on the sea or other navigable waters or on a highway or other public lands. In addition to the general right to the use of such waters and lands, which he shares with the public at large, the adjacent owner has a right of free access which is considered a special property right, and of which, in this country, he cannot be deprived, even by the State, without due process of law and compensation. The existence of such a right as against the State was long disputed, but is now, as the result of recent decisions, firmly established. Peculiar applications of this right are to be found in the common-law rights of mooring vessels and of wharfing out in navigable waters. Its infringement has usually taken the form of a grant of the shore or of land under water for railroad or wharfing purposes, whereby the access of the riparian owner was cut off. The right is not to be confused with that of the abutting owner in a highway or private stream subject to a public use where the fee of the highway or stream is vested in such owner. As to this, see HIGHWAY; RIVERS; RIPARIAN RIGHTS; WATER RIGHTS. Consult Gould, *Treatise on the Law of Waters* (Chicago, 1900).

ACCES'SION (Lat. *ad*, to + *cedere*, to go, move). In the law of property, a mode of acquiring title to land or goods by their annexation to the real or personal property of another, whereby the thing annexed loses its separate identity. It occurs where land is gradually increased by *accretion* (q.v.) or *alluvion* (q.v.), where a tenant or stranger erects a building or attaches a fixture (q.v.) to land, and where a chattel belonging to one is improved by the addition of materials or labor of another, as in the repair of a wagon by adding a wheel or by painting it, or in the conversion of leather into shoes. The legal effect of the annexation is to transfer the title of the thing annexed to the owner of the property so improved or increased, the identity of the former having been merged in the latter; the wheel, the paint, and the labor, in the examples given above, having disappeared as separate articles and being now inseparable parts of the wagon and the leather. The rule governing accessions is that the ownership of the principal thing carries with it that of the inferior thing. But, as the question of superiority or inferiority is not always one of price or value, the rule is sometimes difficult of application. Thus, additions and improvements to land, however extensive and valuable they may be, always accrue to the owner of the soil, and a chattel may be doubled or trebled in value by the expenditure of skill and labor without changing its ownership. But where the identity of a chattel is completely changed by the labor expended upon it, as by the conversion of malt into beer, or where it is enormously increased in value, as by the manufacture of pig iron into watch-springs, the product belongs to the person whose money and labor have effected the transformation. See the article on CONFUSION; and consult Schouler, *Treatise on the Law of Personal Property* (Boston, 1896).

ACCES'SORY. At common law, a person who was not the chief actor in a crime, nor present at its performance, but was concerned in its commission, was an accessory. Treason and misdemeanors did not admit of accessories, however; the former, Blackstone says, because of the heinousness of the crime, and the latter because the law does not descend to distinguish the different shades of guilt in petty offenses. An accessory before the fact is one who counsels or procures the commission of a crime, but who is neither present nor engaged in furthering the transaction when the crime is committed. An accessory after the fact is one who, knowing a felony has been committed, receives, relieves, comforts, or assists the felon. Several reasons are assigned by Blackstone for the common law distinction between principals and accessories, but the tendency of modern legislation is to convert accessories before the fact into principals, and to permit the trial and conviction of an accessory, whether the principal has been tried and convicted or not. Consult the authorities referred to under the title CRIMINAL LAW; also, Wharton, *Criminal Law* (Philadelphia, 1896); Stephen, *A History of the Criminal Law of England* (London, 1883); Harris, *Principles of the Criminal Law* (London, 1899).

AC'CIDENT (Lat. *ad*, to + *cadere*, to fall, happen, occur). In the law of torts, a transaction in which one is harmed by another while the latter is acting lawfully and in the exercise of due care adapted to the exigency of the case. For example, A's and B's dogs are fighting; A beats them in order to separate them, and, as he raises his cane, unintentionally and without negligence hits B, who is standing behind him. B has no cause of action against A, as the injury was accidental. This is now the undisputed law both in England and in the United States, although formerly there was much apparent authority in England for A's liability in such a case. See the authorities referred to under the title TORT.

In equity *accident* denotes an unforeseen event, loss, act, or omission, not the result of negligence or misbehavior in any of the parties; such as the loss of negotiable or other papers; or where some part of a document has been omitted, in which case the court can require its insertion. In penalties and forfeitures, where the injury caused by omission of duty can be reasonably compensated, as in case of failure to pay rent on a given day, the court may relieve the offending party against the penalty of forfeiture. Where there has been neglect or omission through want of information or through negligence to defend a suit, the court may permit the proper steps to be taken. But as a rule, a court of equity will interfere only in favor of persons paying a consideration; so if a seal should be omitted from a conveyance made without consideration, or a clause should be left out of a will, no relief would be extended. It is also ruled that no relief will be granted against a purchaser who has acquired legal rights in good faith for a consideration of value. Consult: Bispham, *Principles of Equity Jurisprudence*. See TORT; CRIME; ACCIDENT INSURANCE; CONTRACT.

ACCIDENT (in logic and philosophy). See CHANCE; LOGIC, and PREDICABLE.

AC'CIDEN'TAL. In music, see FLAT; NATURAL; SHARP; MUSICAL NOTATION.

ACCIDENT INSUR'ANCE. A form of insurance which indemnifies the insured in case of disablement or death as the result of bodily accident. Under the usual contract of accident insurance the only injuries insured against are those caused by violent, accidental, external, and visible means. It does not therefore cover cases of intentional injuries, whether self-inflicted or not, nor cases of injury or death resulting from surgical operations, where the operations were themselves rendered necessary by natural disease or weakness and not by external accident. The fact that the accident was incurred through the misconduct or negligence of the insured will not, in general, affect his rights under the policy, though some companies seek to protect themselves by stipulations that they shall not be liable in cases where the accident was due to the intoxication of the insured, or was incurred while wilfully exposing himself to unnecessary danger. The general principles governing accident insurance are the same as those of fire, marine, and life insurance (q.v.). Employers' Liability (q.v.), under recent English statutes, is a form of accident insurance. Consult: May, *Law of Insurance* (Boston, 1900); Porter, *Law of Insurance* (London, 1898).

ACCIP'ITRES (Lat. plural of *accipiter*, the common hawk), or RAPACES, or RAPTORES. See BIRD OF PREY.

ACCIUS. See ATTIUS.

AC'CLAMA'TION (Lat. *acclamatio*, a calling to, from *ad*, to + *clamare*, to shout, call). An expression of opinion of any assembly by means of the voice. Among the Romans, acclamation was varied in both form and purpose. At marriages the spectators would shout "Io Hymen," "Hymenæe," or "Talassio." A victorious army or leader was greeted with "Io triumphe." In the theatre, approbation for the play was asked by the actor speaking the closing words, who added "Plaudite." In the senate, opinions were expressed and votes passed in such forms as "Omnes, omnes," "Æquum est," "Iustum est," etc.; and the praises of the Emperor were celebrated in certain prearranged sentences which seem to have been chanted by the whole body of senators. At first the acclamation which greeted the works of poets and authors recited in public was genuine; but the modern *claque* was early introduced by rich pretenders to literary ability who kept paid applauders not only for themselves, but lent them to their friends. Nero gave a specimen when he caused 5000 chosen knights and commoners at a given signal to chant his praises in the theatre; they were called "Augustiani," and were conducted by a regular music-master. In the early times of the Christian Church it was not uncommon for a congregation to express their approbation of a favorite preacher during the course of his sermon, and in this manner Chrysostom was frequently interrupted. In ecclesiastical councils voting by acclamation is very common, the division being usually put in the form "placet" or "non-placet."

ACCLI'MATIZA'TION. The adaptation of a species or race to a climate different from that to which it has previously been accustomed. Acclimatization is often confused with naturalization (q.v.), but naturalization is rather the establishment of a species in a new country, and does not necessarily imply a slow adjustment to conditions that are at first injurious, as is the case in acclimatization. Naturalization may take place without any real acclimatization, as when the new country is climatically like the old. This case is illustrated by the large number of plants which have spread eastward or westward along parallels of latitude. Again, acclimatization may occur without naturalization. This is well illustrated by the large number of plants that are hardy, and yet rarely, if ever, run wild; probably the struggle for existence is so keen that such plants fail to establish themselves spontaneously. Still again, naturalization may accompany acclimatization, as in the case of plants that migrate along meridians.

The term acclimatization is employed by the zoölogists in a somewhat broader sense, especially when referring to the adaptation of marine organisms to new conditions of existence. In the latter case climatic changes are relatively unimportant factors. The changes in the character of the water, as respects temperature, contained food supply, marine currents, and pressure as determined by depth, are the influential factors.

IN PLANTS. The most obvious examples of acclimatization are found in cultivated plants. While the original stock as well as the home of most cereals is not definitely known, it is believed that most of them have come from warm, temperate or semi-tropical countries. They have now become fully acclimatized in far northern regions; indeed, some varieties of wheat, barley, etc., flourish even better in cold, temperate districts than in their original home. The peach is believed to grow farther north now than in the days of the ancient Greeks. Evidences of acclimatization apart from man's influence are not wanting; for example, it has been shown that plants grown from seeds that mature at high altitudes are hardier than those grown from seeds that mature at low altitudes.

One of the most interesting results of acclimatization is the change of the plant periods. In Finland and northern Norway barley ripens in 89 days, while 100 days are required in southern Sweden. Varieties of corn which ripen in New York in 93 days require 105 days in Texas. Interesting but not altogether harmonious results have been obtained from deciduous plants taken from temperate into tropical evergreen regions. In most plants the leafless period is shortened, and in some cases (notoriously in the peach tree) it is eliminated altogether, the plant becoming an evergreen. Schimper has observed another change, viz., the gradual loss of rhythmic growth; trees of temperate climes becoming in this respect more and more similar to native tropical trees.

In some cases the capacity for acclimatization is incomplete, i.e., plants are unable to adjust all of their structures and functions to a new climate. This lack of adjustment is seen in some plants of warm regions which, when transported to cool regions, vegetate well but fail to ripen wood. Many plants that can perform all their vegetative functions may still be unable to mature seeds; this is true not only of plants taken into cooler climates, but also in some cases of plants transported into warmer climates. Some species occurring naturally in Spitzbergen are said never to ripen seed; since their reproduction is now wholly vegetative, their original appearance in that region must necessarily have been at a period when the climate was much warmer than at present.

Darwin and others have discussed the influence of individual variation as compared with variation through offspring on the acclimatization of a species. There can be but little doubt of the gradual adaptation of a race through the natural selection of the hardiest individuals of each generation. Darwin also believed in the power of an individual to become acclimatized. The Wyoming experiment station reports that potatoes from the same stock endure in the uplands frosts that would destroy them in the lowlands. This favors the idea of individual acclimatization. Oranges, however, propagate hardier forms by seeds than by grafts, which shows that gradual acclimatization through offspring may be more important. Northern-grown seeds are preferred by farmers, partly because plants grown from them mature sooner than from home-grown seeds. In a few generations, however, this hereditary peculiarity is lost, and a new supply becomes necessary. It should be borne in mind that many of the above statements are based on imperfect observations, and that there is the greatest need for careful experiment in this field.

IN ANIMALS. The capacity of adapting themselves to changed environment is not possessed to the same degree by different species of one genus or by the individuals of any species. It varies with the hardihood, with the capacity for resistance, both of the individual and of the species. Just what the changes are, whether chemical or physical, that go on in the protoplasm of the body during the period of acclimatization, we do not, in many cases, know. In the acclimatization of fishes to denser media it is apparent that some solids are taken into the body, for the fishes sink when transferred again to fresh water. Some organisms possess a remarkably high degree of acclimatization. Thus, few animals can resist a temperature of over 115° F., while 105° F. is the death-point of whole groups. Yet certain organisms live in hot springs in water of much higher temperature, although they may be similar in kind to, or even identical with, those that live in cooler waters outside, and probably were acclimated to the high temperature by slow degrees as they made their way up the outlets into the springs. We know from experimentation that organisms can resist an amount of heat, of density or of poison when accustomed to it by slow degrees, that would have been fatal had they been subjected to it suddenly. We owe the fact that certain domestic animals, such as the horse, cattle, dog, cat, fowls, rats, and mice, have spread with mankind over nearly all the world to the great capacity for acclimatization of these forms, most of which have originated in warm climates. Likewise the ubiquity of such food-plants as the potato and cereals, as well as certain weeds, is due to their great capacity of adaptation; for those plants and animals that have a limited amount of adaptation have likewise a limited range of distribution. The quality and the strength of some animals seem actually to improve in a new climate. Thus the merino sheep imported into Silesia and Pomerania from Spain seem to be superior in those lands to their Spanish ancestors, while the fleece of the Syrian sheep becomes finer in Spain; but in such cases it is difficult to say just how much is due to climate and how much to the breeder's skill and care. Many of our domestic animals have been so long in the countries in which we now find them that we can never hope to know anything about the history of their importations; but the silkworm is comparatively so late an importation into Europe that we can follow its progress. It was brought from China first into Italy, and now it is acclimated not only to southern France but even to the coast of the Baltic Sea, and it is able to live in some parts of the United States.

Of late years numerous acclimatization societies have been formed (the best known of which is the Société d'Acclimatation of Paris), having as their object the transference of seemingly desirable animals from their native lands to other parts of the world where they may thrive to human advantage. This has been found feasible in many instances, so far as the ability to become acclimated is concerned, but in many cases the expected benefits have turned to evils through overmultiplication or other means of becoming a local pest, and such experiments are now rarely attempted. The introduction of salmonoid fishes from the Pacific to the Atlantic side of the United States, and from Europe to New Zealand, of bumble-bees into New Zealand, and of several insects, such as ladybirds, as enemies of agricultural pests, are instances of the more beneficial sort. The European house-sparrow in North America, the mungoos and agua-toad in the West Indies, the rabbit in Australia, and a great host of more or less accidentally introduced insects destructive of plants, etc., are cases of an opposite character. For particulars in respect to these, see accounts of the respective animals.

IN PEOPLE. This treats of the ability of men to maintain themselves in a country with radically different climatic conditions from those from which they migrate. At present the inevitable tendency of European and American peoples to spread over the major part of the earth gives the question many practical bearings. Can a race and a civilization from the temperate zone be transplanted to the tropics? The question is a double one: (1) Can individuals from the temperate zone live in the tropics for a few years and maintain their health and vigor; (2) can they work at their usual occupations, maintain their customary vigor, energy, and ability, rear families and propagate their kind for several generations? On the first point most authorities agree in the affirmative, provided reasonable provision for sanitation is made, and temperance and thrift prevail among such emigrants. On the second point authorities differ, with the balance in the negative. Races differ in their ability to adjust themselves to new climatic conditions. The individual or the race may not succumb at once when transferred to a very different climate, and yet the acclimatization may be only partial. Certain organs only of the body may be affected by the changes, so that "diseases of acclimatization" may be induced. Thus Europeans are liable in tropical countries to suffer from diseases of the liver, while natives of the tropics are subjected to pulmonary troubles in temperate zones. The African in the United States has a high death rate from lung affections. On the other hand, loss of hardihood induced by climate may express itself mainly in deterioration in size, as is the case with the Shetland pony. So far as the human races are concerned there seems to be a direct ratio between intelligence and capacity for acclimatization. The Anglo-German race is able to endure climatic changes with less loss of vigor than any other European race, and for this reason has been able to surpass all the others as colonizers. High moral qualities are needed. Homesickness is a frequent cause of failure. Temperance and thrift are excellent qualities for success, as evidenced in the history of Jewish and Chinese emigration. Mankind is tolerant of great extremes of climate, —97° F. to 154° F. being the greatest extremes recorded as having been endured by human beings, though no such range of variation has ever been endured by one people or in any one place. Not only temperature but also meteorological conditions have an effect, and moisture is, next to temperature, the most important element.

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AC'CO, or **AC'CHO.** See ACRE.

ACCOLADE, ăk'kô-lăd' (Fr. an embrace, kiss, from Lat. *ad*, to + *collum*, neck). A part of the ceremonies of conferring knighthood in the Middle Ages. The sovereign or other superior embraced the aspirant around the neck *(ad collum)*. The term is sometimes applied to the later ceremony of giving a slight blow on the shoulder with the flat of the sword. In music, the accolade is the couplet uniting several staves, as in part music or pianoforte music.

AC'COLON. In Sir Thomas Malory's *Morte d'Arthur*, a knight of Gaul, who obtained possession of King Arthur's sword Excalibur through the treachery of Morgan le Fay. He died after his fight with the king (Book IV.), which had led to the discovery of the trick and the recovery of the sword.

ACCOLTI, ȧk-kôl'tê, BENEDETTO (1415-66); called the Elder. An Italian jurist. He was born at Arezzo, Italy, and died at Florence. At first a professor of law at Florence, he afterward became chancellor of the Republic, and occupied this position until his death. He was gifted with a marvelous memory, and is said on one occasion to have repeated word for word a Latin discourse which the Hungarian ambassador had addressed to the magistracy of Florence. His historical attainments were considered inferior to his knowledge of law. Accolti's principal publications are: *De Bello a Christianis Contra Barbaros Gesto pro Christi Sepulchro et Iudæa Recuperandis Libri Quatuor* (Venice, 1572; Florence, 1623, with a commentary by Scoto), which furnished the material for Tasso's *Jerusalem Delivered;* and *Præstantia Virorum Sui Ævi* (first published at Parma in 1689 and frequently reprinted). Consult Potthast, *Bibliotheca Historica Medii Ævi*, Volume I. (Berlin, 1896).

ACCOLTI, BERNARDO (1465-1536). An Italian poet, a son of Benedetto Accolti (q.v.). He was born at Arezzo, and is said to have enjoyed so much popularity as a poet that the shops were closed and multitudes flocked to hear him recite his verses. But although styled by his contemporaries "The Unique," such portions of his works as have come down to us scarcely justify so high an estimate of his ability. His poems were first published at Florence in 1513 under the title: *Virginia, commedia, capitoli, e strambotti di Messer Bernardo Accolti Aretino.* They were republished at Venice in 1519 and have since been frequently reprinted.

ACCOM'MODA'TION (Lat. *ad*, to + *commodus*, fit, suitable). The power of altering the focus of the eye so that rays coming from an object nearer than twenty feet are brought together on the retina. This is brought about by changes in the convexity of the crystalline lens (q.v.). The latter possesses a degree of elasticity which tends to make it assume a spherical form. The lens being suspended by a ligament extending around its periphery, the ciliary muscle is so attached that when it contracts it causes a relaxation of the suspensory ligament. This diminishes the tension upon the latter and allows the lens to become more spherical, chiefly on its anterior surface. At the same time the pupil contracts, and the visual lines of the two eyes converge. The *range of accommodation* is the distance between the "far point" or the farthest point of distinct vision and the "near point," or nearest point at which the eye can distinctly see objects. As a person's age increases, the power of accommodation gradually diminishes and the near point recedes. At ten years it is 2.8 inches; at thirty it has reached 5.6 inches, and after forty-five it increases rapidly, until at seventy it is 160 inches, and at seventy-five, infinity. See VISION.

ACCOMMODATION (IN THEOLOGY). Either the practice of forcing Scripture texts to bear other than their plain meaning, or the theory that Jesus Christ in his teaching fell in with certain errors of his time, e.g., belief in demoniacs, and thus *accommodated* himself to the mental and moral conditions of the Jews.

ACCOMMODATION BILL OR NOTE. A draft, bill of exchange or promissory note, one or more of the parties to which has signed it without receiving value therefor, and for the purpose of lending his credit to some other party thereto. Such a bill is a valid, negotiable instrument, and the accommodation party, whether known to be such or not, is liable thereon to a holder for value. But, as between himself and the party accommodated, he is only a surety, and is, as such, exonerated by the giving of time to the principal debtor without his assent. See PRINCIPAL AND SURETY; BILL OF EXCHANGE; NEGOTIABLE INSTRUMENTS, and the authorities therein referred to.

ACCOM'PANIMENT. The additional instrumental part which, in music written for a solo voice or instrument, gives harmonic and rhythmic support to the solo part or melody; as the pianoforte part in a song, the orchestral part in a concert, etc. An *ad libitum* accompaniment is one that is not a part of the structure of the composition, and may therefore be performed or omitted at pleasure. An *obligato* accompaniment, on the contrary, forms an integral part of the music and is indispensable. The accompanist of the present day has an easy task compared with that of his predecessors in the seventeenth and eighteenth centuries, and even later. In the scores of the old masters, especially those of Handel and Bach, the accompaniments were not written out in full. A single bass part was given, and the accompanying harmonies were indicated by figures over the notes. This species of musical shorthand became known as figured or thorough bass, and also *basso continuo*. The accompanist at the organ or harpsichord translated these figures at sight into their equivalent harmonies, and with them, improvised, with runs, trills, and various ornaments, the sort of accompaniment that the music needed. The musicians of the time became very expert at this difficult accomplishment, both Handel and Bach being renowned for their wonderful polyphonic accompaniments. Many of these old scores have been worked out by skilled musicians, who have filled out the missing parts and arranged the accompaniment for the modern orchestra. Among the scores to which "additional accompaniments" have been written are those of Handel's *Messiah*, by Mozart; *Israel in Egypt*, by Mendelssohn; and the great edition of Bach's works, by Franz. Consult Apthorp, *Musicians and Music Lovers* (New York, 1894).

ACCOM′PLICE (through confusion with *accomplish*, for earlier *complice*, companion, especially in crime, from Lat. *complex*, closely connected, confederate). One whose participation in a crime renders him liable to punishment, either as a principal or as an accessory. Hence, a person who acts only the part of a detective is not an accomplice, although he may pretend to be the criminal's confederate, for his act, not being done with criminal intent, is not punishable. The term is most frequently used in cases where one of several criminals has turned state's evidence. As his testimony against his fellows is apt to be given in the hope of securing immunity for himself, the court usually charges the jury that it is open to suspicion, and many modern statutes declare that a conviction cannot be had upon the testimony of an accomplice, unless he be corroborated by such other evidence as tends to connect the defendant with the commission of the crime. Consult the authorities mentioned under the title CRIMINAL LAW; also Wharton, *Criminal Law* (Philadelphia, 1896).

ACCORAMBONI, ȧk′kô-rȧm-bō′nê, VITTORIA (?-1585). An Italian woman remarkable for her beauty and her tragic history. She was sought in marriage by Paolo Giordano Orsini, Duke of Bracciano, who was supposed to have murdered his wife, Isabella de' Medici, but her father gave her to Francesco Peretti, nephew of Cardinal Montalto, afterward Pope Sixtus V. The husband was assassinated in 1581, and the widow fled from her father-in-law's house to that of the Duke of Bracciano, the supposed murderer. Pope Gregory XIII. opposed her marriage to the duke so far as to keep her a prisoner in the castle of Sant' Angelo nearly a year, but that did not prevent their union. Not long afterward the duke died, leaving nearly the whole of his fortune to the widow. This so incensed Ludovico Orsini, a relative, that he caused the widow to be murdered in her home in Padua, December 22, 1585. Her history has been made the subject of novels and plays, among others, of Webster's tragedy, *The White Devil.* Consult: Gnoli, *Vittoria Accoramboni* (Florence, 1870).

ACCORD′ AND SAT′ISFAC′TION. In the law of contracts, a mutual agreement entered into by the parties to a contract by which one party agrees to discharge the other from his obligation under the contract, in return for the other party's promise to do or give something. The satisfaction is the performance of the promise to do or give something. The agreement for the discharge of the contract may be unilateral, that is, the promise is given on the one side in return for an act on the part of the promisee, in which case the accord and satisfaction come into existence simultaneously. At common law it was early held that an accord with satisfaction was a good defense to an action founded upon simple contract, but that a mutual agreement to discharge a pre-existing contract, being mere promise given for promise, was an accord only and not a valid defense at law. This was either because mutual promises, not being good consideration for each other, were not regarded as binding, or because the law would not enforce an agreement which merely substituted one cause of action for another, or for both reasons. The first, owing to the changed conception of consideration, has ceased to exist, and the second is now generally disregarded, most jurisdictions holding that a mere accord without satisfaction is a valid discharge of a simple contract, though the decided cases are not altogether harmonious on this point. Agreements never to sue on the earlier contract were regarded as a good accord or accord and satisfaction and a valid defense, but agreements not to sue for a limited time were not admitted as a defense at common law; but equity might enforce them by enjoining action on the earlier contract. In the case of contracts under seal, before breach, accord and accord and satisfaction were not admitted as valid defenses at common law, but after breach of the obligation under seal, it was regarded as a mere right of action for damages, of no higher nature than a simple contract and subject to the same defenses. Equity under proper conditions would enforce the accord even when entered into before breach of the contract under seal by enjoining all action upon the latter; and in most jurisdictions where equitable defenses may be pleaded at law, accord or accord and satisfaction may now be set up as a defense to an action on the instrument under seal. An accord must always be an agreement founded on good consideration. Thus, a mere agreement founded upon a promise to do or give something which the promisee was already bound to do (for example, an agreement to pay a lesser sum in lieu of a debt for a greater) is not valid as an accord. An apparent exception to this rule exists in cases where the precise amount or character of the obligation under the earlier contract was uncertain, in which case an accord by way of a compromise agreement is regarded as made upon valid consideration. A real exception to the rule was allowed in case of compromise agreements in which a debtor agreed to pay a smaller sum in lieu of a greater to his creditors in return for their promise to release him from his debts to them. In a number of the States, notably New York, a written receipt given by the creditor to a debtor without consideration and with intent to release the debts is allowed to be a valid discharge of the debts. This is anomalous. See the authorities referred to under CONTRACT.

ACCOR′DION (Fr. *accorder*, to accord, be in harmony). A musical instrument which produces its tones by the vibration of metallic tongues of various sizes, while wind is supplied by the action of a hand bellows. Two sets of tongues make it possible to produce the same tones either by pressing or pulling the bellows. It was invented by Damian of Vienna in 1829. See CONCERTINA and HARMONIUM.

ACCOUNT′ (Lat. *ad*, to + *computare*, to sum up, reckon, compute). In its broadest sense, a catalogue of items, debt or credit arising out of contracts, as in the case of merchants; or out of a fiduciary relation, as in the case of principal and agent; or from a duty imposed by law, as in the case of an administrator or public officer. A mutual account is one containing reciprocal demands or charges against the parties; as the account between two merchants, or between a merchant and a customer, each of whom has sold goods to the other. Before an account is rendered or adjusted, it is spoken of as "open" or "current." A *stated account* is one which has been accepted as correct by the party against whom it states a balance. The debtor's assent to the correctness of the account as stated need not be express; it may be implied from his retention of an account rendered without an objection to it within a reasonable time. The acceptance of an account stated, or, to use the ordinary legal phrase, the stating of an account, is said to be in the nature of a new promise; and the creditor suing upon such an account need not set forth the subject matter of the original debt. Originally an account stated was confined to transactions between merchants; but in England and in most of our jurisdictions its scope has been extended to accounts between all creditors and debtors. In some States, however, stating an account between others than merchants does not create a new cause of action, but is available to the creditor only as an admission by the debtor. Even after an account has been stated it may be corrected for fraud or mutual mistake.

The action of account at common law has fallen into disuse, partly because it was difficult, dilatory and expensive, but chiefly because a court of equity possessed more extended authority and better machinery in cases involving an account. Equity will entertain an action for an accounting where a fiduciary relation exists between the parties, such as that of principal and agent (q.v.), trustee, and *cestui que trust*, guardian (q.v.) and ward; or where there is a mutual account between plaintiff and defendant; or where there are circumstances of complication, as in partnership (q.v.) accounts. So an accounting may be had as incidental to the exercise of other equity jurisdiction, as in mortgage foreclosures.

ACCOUNT'ANT. In the United States a term applied widely to any one who keeps accounts, i.e., a bookkeeper, though there is a tendency to restrict it to those whose accounts present a certain difficulty and complexity. In England the term designates an officer employed by railway companies, banks, etc., from time to time to inspect and verify their books and accounts, and to make out periodical statements and balance sheets. It is recognized as a special branch of business. Generally speaking, the work of an accountant may be classified under two divisions: (1) All those matters that involve the investigation of the books of a firm or company, with the making up of balance sheets, statements of all kinds, and reports; and (2) the management of estates, whether of bankrupts or others. While the last named function is not known in the United States, the practice of a periodical report by accountants not permanently connected with the business is growing among the larger financial institutions. With this practice there have arisen professional accountants whose function it is to act as impartial witnesses to the accuracy of the accounts of corporations and similar enterprises, and to make expert investigations in controversies at law involving accounts.

AC'CRA. See AKKRA.

ACCRE'TION (Lat. *accretio*, an increase, from *ad*, to + *crescere*, to grow). In law, the gradual extension of the boundaries of land at the expense of the sea, or of a neighboring owner, by the imperceptible action of natural forces, as by the recession of the ocean, the deposit of silt and earth by a stream, the drying up of a pond, etc. The word is sometimes, though improperly, used to include the various kinds of accession (q.v.) and as the equivalent of that term; but it is in its legal sense properly applicable only to that form of accession in which land is added to other land by the process above described. Where the land so gained is washed up by the sea, or deposited by a running stream, or left bare by the gradual drying up or retirement of the water boundary, it is known as alluvion (q.v.). As above indicated, the process must, in order to result in an accretion, be so slow as to be imperceptible in its progress. If sudden, no change of ownership results, the land so exposed remaining the property of the sovereign or of the neighboring proprietor affected thereby. Thus a boundary stream may, by changing its course gradually, little by little transfer the ownership of the land on one side to the opposite proprietor, whereas a sudden change of course would not affect the boundaries of the two parcels of land in the slightest degree. Consult: Gould, *Treatise on the Law of Waters* (Chicago, 1900); Angell, *Treatise on the Law of Watercourses* (Boston, 1877).

AC'CRINGTON. A manufacturing town in Lancashire, England. It has recently increased much in size and importance, and lies in a deep valley, surrounded by hills, about 20 miles north of Manchester and 5 miles east of Blackburn, on the banks of the Hindburn (Map: England, D 3). Among its notable buildings are Christ Church, a fine Gothic edifice, erected in 1838, and the town hall, a handsome building in the Italian style. The town was incorporated in 1878. The gas and water supply are owned jointly by the town of Accrington and several other neighboring towns. The town owns public baths, markets, slaughter-houses, and cemetaries, and maintains a technical school. It also owns its street railways, which are leased to private companies. The inhabitants are mostly employed in cotton factories, dye-works, chemical works, weaving, and calico-printing. Accrington is considered the centre of the cotton-printing industry. There are coal mines in the neighborhood, in which many of the people find employment. Accrington is advantageously situated in regard to communications, being a station on the Lancashire and Yorkshire Railway. Its growth of population has been very rapid. From less than 9000 in 1841 it rose to 38,603 in 1891, and in 1901 to 43,095.

AC'CUBA'TION (Lat. *ad*, to + *cubare*, to lie down). The reclining posture of Greeks and Romans at table. Among the Greeks a low table was placed beside each couch, on which usually two persons reclined, resting on the left arm, which was supported by cushions. Among the Romans three couches were placed, so as to form three sides of a square, and three persons reclined on each couch. The middle couch was the most honorable. Respectable women did not adopt this position until the time of the Roman Empire.

ACCUM, ăk′kụm, Friedrich (1769-1838). A German chemist. He was born in Westphalia, went to London in 1793, and became professor of chemistry there in 1802. He was known chiefly on account of his work, *A Practical Treatise on Gaslight* (1815), which had the effect of introducing the illuminant in England. The book was translated into several languages. In 1822 he became professor in a technical institute in Berlin, where he died.

ACCU′MULA′TIONS (Lat. *ad*, to + *cumulare*, to pile, heap). In law, the accumulated interest and income of property held in trust upon a trust created for the purpose of effecting such accumulation for the benefit of the *cestui que trust* (q.v.). The law relating to accumulation is closely related to the rule against perpetuities (q.v.) as now defined by modern statute. It was the common law rule that any disposition of real estate which postponed a vesting of any interest in the estate for longer than a life or lives in being and twenty-one years additional thereafter was absolutely void. This rule was deemed to be violated by the creation of a trust for accumulation for any greater period. This continued to be a rule of decision until the passage by the English Parliament of the so-called Thellusson Act. (See Thellusson *v.* Woodford, 4 Ver. p. 227, Gray Pub. Assoc., Boston.) This act placed several limitations on the common law rule as to accumulation. The rule relating to accumulation is now regulated wholly by statute in most jurisdictions, and generally the power to create trusts for accumulation is limited to the creation of a trust for the life of the grantor only or for twenty-one years or during the minority of the beneficiary. See the authorities referred to under Trust and Perpetuity.

ACCU′MULA′TORS. Apparatus for equalizing pressure or for the accumulation of energy for intermittent use. The storage battery and the Leyden jar are electrical accumulators. (See Storage Battery; Condenser.) Hydraulic accumulators are extensively used in connection with hydraulic machinery for operating cranes, punching and riveting machines, presses, etc. The simplest way of storing up water for pressure purposes is to erect a tank at a sufficient height to give the required pressure by the weight or head of the water column alone. This arrangement is generally adopted for hydraulic elevators in warehouses and lofty buildings. (See Elevators.) Where very high pressures are required, however, it becomes impracticable to adopt a tank or water tower, since the elevation required to give the necessary pressure would be impracticable to obtain, 700 pounds pressure, for instance, requiring a tank 1610 feet high. In such cases accumulators are employed, and they generally assume the form of a vertical cylinder resting on a firm base and having a plunger working through a stuffing-box at the top. This plunger has at its upper end a yoke which carries by means of suspension rods a heavy weight of cast iron or other heavy material. A power pump forces water into the cylinder at a pressure sufficient to lift the weighted plunger to the top of the cylinder, where the plunger strikes a stop which prevents its rising further and prevents the further escape of water from the pump. In this position the cylinder is filled with a column of water, which supports the weighted plunger on its top. As water is drawn off from the cylinder to supply the crane, press, riveter, or other machinery, the weighted plunger descends, always keeping a pressure on the top of the water column equal to the combined weight of the plunger and its load. As soon as the plunger descends the pump resumes work and raises it again. By this combination of operations the water pressure is always kept constant for supplying the hydraulic machinery. Sometimes steam or air pressure acting on the top of the plunger is substituted for the more common suspended weights. Hydraulic accumulators are built to give pressures ranging from five pounds to ten tons per square inch.

AC′CUSA′TION. A legal term which signifies either the act of charging one with a crime, or the charge itself. When the charge is made outside of a judicial proceeding it may subject the accuser to an action for defamation (q.v.), while if made in the course of a judicial proceeding it is generally not actionable. A threat or a conspiracy to accuse another of a crime is indictable. See Blackmail and Extortion.

ACCU′SATIVE CASE. See Declension.

ACELDAMA, ȧ-sĕl′dȧ-mȧ, or **AKELDAMA,** ȧ-kĕl′dȧ-mȧ (R. V.). According to Acts i. 19, "the field of blood;" but inasmuch as the original Greek text furnishes the form *Aceldamach*, it has been suggested by August Klostermann (*Probleme im Aposteltexte*, pp. 1-8) that the second element, *damach*, is the Aramaic word "to sleep," so that the real meaning of the term is "field of sleep." Such a name would have been appropriate for a field which, according to Matthew xxvii : 8, was bought by the priests of Jerusalem as a field in which to bury strangers. Aceldama was acquired in this way with thirty pieces of silver which Judas Iscariot received as a reward for betraying Jesus, but which in the hour of his repentance he returned to the priests. The designation of Aceldama as a "potter's field" in both of the passages of the New Testament referred to connects the place with the "potter's house" mentioned by Jeremiah xviii : 2; xix : 2. It would appear, therefore, that Aceldama is older than the story told of it in the New Testament, and its designation as a "field of blood" is but a play upon the word, introduced to add color to the narrative of Judas Iscariot. A tradition of considerable antiquity locates Aceldama on a level overhanging the "valley of the son" (Hinnom) and halfway up the hill. As early as the sixth century this traditional site was used as a burying-place for Christian pilgrims, and continued in use until the seventeenth century. A history and description of the site is furnished by Schick in the quarterly statement of the Palestine Exploration Fund of 1892, pp. 283-289.

ACEPH′ALI (Gk. ἀ, *a*, priv. + κεφαλή, *kephalē*, head; i.e. headless). A name given (1) To metropolitans and bishops who have no ecclesiastical head over them. (2) To certain ecclesiastical parties: (a) those bishops at the ecumenical council of Ephesus in 431 who refused to join either the party of Cyril or of John of Antioch; (b) those who rejected the doctrinal decision of the ecumenical council held at Chalcedon in 451 upon the nature of Christ (see Christology); (c) the Eutychian adherents of Peter Mongus, who refused to subscribe to the Henoticon in 482, designed to end the

Monophysite Controversy. (3) To clergy belonging to no diocese. (4) To the Flagellants (q.v.).

ACEPH'ALOCYST (literally, a cyst without a head; Gk. *ἀ, a*, priv. + *κεφαλή, kephalē*, head + *κύστις, kystis*, a bladder, bag). A hydatid growth found in the liver, kidneys, or other glandular organs of man, and sometimes of lower animals. It is a globular sac with walls of condensed albuminous substance of laminated composition. In its cavity is a colorless fluid of albuminous and gelatinous composition. Sometimes many secondary cysts occur. They are of parasitic origin, being produced by the larvæ of a species of tapeworm (*Tœnia echinococcus*).

A'CER. See MAPLE.

ACERBI, å-chĕr'bė, GIUSEPPE (1773-1846). An Italian naturalist, born at Castel Goffredo. He studied at Mantua and became proficient in natural science. He was the first Italian to reach North Cape (1798). In 1816 he founded the *Biblioteca Italiana*, a literary review published at Milan, and from 1826 to 1836 was Austrian consul-general in Egypt, where he made important archæological collections for the museums of Vienna, Padua, Milan, and Pavia. He published (in English) *Travels Through Sweden, Finland, Lapland* (2 volumes, London, 1802).

ACERRA, å-chĕr'rå, the ancient ACERRÆ. An episcopal city in south Italy, nine miles northeast of Naples and opposite Mount Somma, from which there is an excellent view of Vesuvius. It has a cathedral and a seminary. The country is fertile, but until recently, when the marshes were drained, was extremely unhealthful, owing to the inundations of the Agno, which is the *Clanius non œquus Acerris* of Vergil. Pop., 1901, 16,443.

ACET. A combining form used in various chemical terms, and ultimately derived from Lat. *acetum*, vinegar; as in *acet*al, *acet*anilid, etc.

ACETAL, ăs'ė-tăl, $CH_3CH(OC_2H_5)_2$. A colorless liquid of agreeable odor and taste. It is readily obtained by heating a mixture of aldehyde and ordinary alcohol. It has been used to improve the flavor of wine.

ACETANILID, ăs'ĕt-ăn'ĭl-ĭd. A crystalline powder made by the action of acetic acid on aniline. It is odorless, slightly bitter, sparingly soluble in water, but freely so in alcohol, ether, and chloroform. Chemically, it is phenylacetamide, $CH_3CONHC_6H_5$. It is known also by the trade name antifebrin. Its action resembles that of antipyrine (q.v.), but is less likely to cause eruptions, respiratory disturbance, cyanosis, and collapse, and its administration is followed by less sweating. In health it does not affect the temperature to any extent. Its uses are similar to those of antipyrine, but being insoluble it cannot be used hypodermatically, and is generally given in tablet, capsule or wafer. The dose required is much smaller than that of antipyrine.

ACETATES, ăs'ė-tåts. The salts of acetic acid, which are generally prepared by the action of acetic acid on metallic carbonates or hydroxides. Most acetates are soluble in water. To prove the presence of an acetate in a solution, the analytical chemist adds to the solution some strong sulphuric acid and a little alcohol and heats the mixture for a few seconds; by this treatment of an acetate solution ethyl acetic ester is produced, which is readily recognized by its pleasant and characteristic odor. Some of the acetates are: (1) *Aluminium acetate.* This has been obtained only in its aqueous solution, which is used as a mordant under the name of "red liquor." (2) The *acetate of iron*, known as "black liquor," is likewise used as a mordant in dyeing and printing cotton. The acetates of (3) lead, (4) ammonium, and (5) potassium are much used in medicine. *Lead acetate*, commonly known as "sugar of lead," is used for external applications as an astringent. *Ammonium acetate* is used to promote perspiration; it is prepared best by passing an excess of gaseous ammonia into strong acetic acid. *Potassium acetate* is very largely used as a diuretic. Other metallic acetates are mentioned under the names of the metals (qq.v.).

ACE'TIC ACID, CH_3COOH. The sour principle of vinegar, an acid composed chemically of carbon, hydrogen, and oxygen. The commercial acid is largely used in the manufacture of acetates, dye-stuffs, etc. Concentrated acetic acid burns the skin, and is therefore applied as a caustic to remove small warts and corns. Like any other acid, if taken internally for any length of time, dilute acetic acid impairs the digestion and absorption of food.

Acetic acid occurs here and there in the organic world. It is found ready formed in sweat and other animal secretions, as well as in the juices of various plants. It is manufactured either by the oxidation of ordinary alcohol through fermentation (see VINEGAR), or by the destructive distillation of wood. The aqueous product obtained in the latter process is subjected to fractional distillation, and the fraction constituting impure acetic acid (called *pyroligneous acid*) is neutralized with soda or lime. In this manner a solution of sodium or calcium acetate is obtained; this solution is evaporated to dryness, and the remaining salt is freed from water and organic impurities by heating above 400° F. Pure acetic acid is prepared by distilling the acetates thus obtained with strong sulphuric acid. The pure anhydrous acid is known as glacial acetic acid; at temperatures below 62° F. it is solid and crystalline; above that temperature it forms a colorless liquid readily known by its pungent, penetrating odor. Since carbon is one of its constituent elements, it is, of course, classed with the compounds of organic chemistry. It is a comparatively weak acid, its salts being broken up not only by the strong mineral acids, but even by many organic acids. Besides the methods just mentioned, acetic acid can be made by synthesis from the constituent elements. When electric sparks are passed between carbon poles in an atmosphere of hydrogen, acetylene gas is produced; and when oxygen (furnished, say, by chromic acid) is made to act upon acetylene in the presence of water, the acetylene combines with oxygen and water, and, as a result, acetic acid is formed according to the following chemical equation:

$$\underset{\text{Acetylene}}{C_2H_2} + O + H_2O = \underset{\text{Acetic acid}}{C_2H_4O_2}$$

It would not pay, however, to use this method in manufacturing acetic acid for practical purposes.

ACETO-ACETIC (ăs'ē-tô-å-sē'tĭk) **ES'TER,** $CH_3COCH_2COOC_2H_5$. A colorless liquid organic substance obtained by the action of metallic sodium on the ester formed by the union of acetic acid and ordinary alcohol (i.e., ethyl acetic ester). Aceto-acetic ester mixes in all proportions with alcohol or with ether, but is only sparingly soluble in water. It boils at 180° C. The two hydrogen atoms of its CH_2 group are capable of being replaced either by metals or by hydrocarbon radicles like methyl (CH_3), ethyl (C_2H_5), etc., and the substitution products thus obtained yield, on treatment with acids and alkalies, a variety of important carbon compounds. The ester is, therefore, extensively used for the artificial preparation of various substances for scientific purposes.

ACETONE, ăs'ē-tōn, or DIMETHYL KETONE, CH_3COCH_3. A colorless organic liquid boiling at 56°.3 C., and having at 20° a specific gravity of 0.792. It is volatile and inflammable, has a pleasant ethereal odor, dissolves various organic substances such as fats and resins, and mixes in all proportions with water, alcohol, and ether. It is separated from its aqueous solutions by means of calcium chloride. It dissolves considerable quantities of acetylene gas (q.v.), and absorbs a very large amount of sulphurous anhydride. It is used as a solvent as well as for the manufacture of chloroform, iodoform, etc. Acetone is produced when various organic substances are subjected to destructive distillation; it is thus found in pyroligneous spirit (see METHYL ALCOHOL) obtained by the dry distillation of wood. It is separated from wood spirit by distilling over calcium chloride. It is usually prepared by distilling barium acetate at a moderate heat, according to the following chemical equation:

$$\underset{\text{Barium acetate}}{(CH_3COO)_2Ba} = \underset{\text{Acetone}}{C_3H_6O} + BaCO_3$$

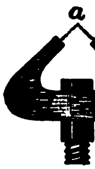
The somewhat impure product obtained either from wood spirit or from barium acetate may be readily purified and dehydrated by the use of the acid sulphite of sodium, with which it combines to form a crystalline solid compound. Pure acetone is obtained from the latter by distilling with sodium carbonate. When acted on by chlorine in the presence of alkali, acetone is converted into chloroform. Iodoform is similarly produced by the action of iodine (in ammonium iodide solution) and ammonia upon acetone, the reaction forming the most sensitive test for acetone that is known to chemists. When acetone is distilled with strong sulphuric acid, mesitylene is produced; this reaction has been of great value in determining the chemical constitution of a vast number of benzene derivatives allied to mesitylene. Acetone occurs in small quantities in the blood, and is present in the liquid passing over when urine is distilled. It has long been known to chemists as a product of distillation of acetates; its composition was first determined by Liebig and Dumas in 1832.

ACETONES. See KETONES.

ACETYL, ăs'ē-tĭl. An atomic group or radicle in organic chemistry. See CARBON COMPOUNDS.

ACETYLENE (from *acetyl*), $HC{\equiv}CH$. A colorless gas composed chemically of carbon and hydrogen. It is present in small quantities in ordinary illuminating gas, and has a characteristic disagreeable odor somewhat resembling that of garlic. Its "critical temperature" is 37° C. (about 98°.6 F.); that is to say, no matter how great the pressure to which it may be subjected above 37° it will remain gaseous, while at 37° a certain pressure, called the "critical pressure," is necessary and sufficient to liquefy it; the critical pressure of acetylene is 68 atmospheres. Acetylene burns with a brilliant flame and is used as an illuminant. It is best made for scientific as well as for industrial purposes by the action of water on the carbide of calcium (q.v.). It is thus produced, for instance, in bicycle "gas lamps." The various apparatus devised for the manufacture of acetylene produces it either in the gaseous state or, by immediate compression, in the liquefied state. We will distinguish two types of apparatus. In the first, the *carbide is contained in an appropriate reservoir, into which water is introduced* at a required rate. Such apparatus is rather inconvenient and somewhat dangerous, for the reason that in the mass of carbide considerable rise of temperature may occur at the point immediately attacked by water; besides, a crust of lime may form on the surface of a lump of carbide, and when the water at last penetrates to the core of the lump a sudden and more or less violent reaction may ensue; all of which would naturally result in uneven generation of gas, variations of pressure, and, perhaps, the explosive inflammation of the gas. In the second type of apparatus, on the contrary, the *carbide is thrown into a considerable mass of water*, whereby undue elevations of temperature and irregularity of action are completely avoided. As the presence of impurities in acetylene adds considerably to the danger of using the gas, various methods of purification have been proposed. Now, the nature and quantity of impurity in acetylene depends entirely on the composition of the carbide used in its manufacture, and a very pure acetylene has been produced on quite a large scale simply by employing a pure carbide. With air or oxygen acetylene forms extremely explosive mixtures; mere external friction of a vessel in which such a mixture is contained may cause an explosion. But even when isolated and pure acetylene is explosive if kept *under pressure of more than two atmospheres;* and it is very dangerous indeed when preserved in liquid form. It has, instead, been stored in solution in ordinary acetone, which absorbs considerable quantities of it. If the pressure under which the gas is dissolved in acetone is not very great, explosion can occur only in the gaseous volume above the surface of the liquid; the dissolved portion of the gas does not take part in the explosion. Under any circumstances, sudden compression of a volume of acetylene may cause an explosion. Acetylene is slightly, if at all, poisonous; it is certainly much less poisonous than ordinary illuminating gas.

Acetylene contains a high percentage of carbon, and the amount of heat generated in its combustion is very large. These are the causes to which its high illuminating power is due; for, in order that a flame may be luminous, it must contain a large amount of carbon particles, and its temperature must be high enough to keep those particles in a state of incandescence. In order that acetylene may yield a large amount of light, it must be properly burned. The numerous burners devised for this purpose are constructed with a view to burning either pure acetylene or mixtures of acetylene and other gases, such as nitrogen, carbonic acid gas, and especially marsh gas. We reproduce here the Perrodil burner, which, while adapted for use with pure acetylene, allows it to be sufficiently mixed with air before it reaches the point *a*, where it begins to burn.



Acetylene is one of the cheapest illuminants. It has, besides, the important advantage over other illuminants of being easily produced and requiring no special establishment for its manufacture. In the opinion of eminent experts, the danger connected with storing it even in large quantities is not great enough to justify a verdict against its introduction into common use.

We will mention a few other uses to which acetylene may be applied:

1. If calcium carbide were cheaper, acetylene might be used as an enricher; i.e., to increase the illuminating power of coal gas and of other combustible gases.

2. When acetylene is passed into an alkaline solution of iodine, the substance *di-iodoform* (C_2I_4) is produced. This substance possesses the antiseptic properties of ordinary iodoform without having the strong and annoying odor of that substance. In the last few years di-iodoform has been manufactured on an industrial scale.

3. Under the influence of electric sparks acetylene combines directly with nitrogen to form *prussic* (hydrocyanic) *acid*. It might, therefore, be used in the cyanide industry.

4. A process has been patented in Germany for the manufacture of *sugar* from acetylene.

5. When heated with hydrogen, acetylene is converted into ethylene, and by the action of sulphuric acid and water the latter yields ordinary *alcohol*. It has been argued that if pure alcohol, manufactured by this method, could be substituted as an article of commerce for the highly toxic liquors so freely sold at the present day, a great deal would be accomplished toward diminishing the evil of alcoholism. Under the present conditions, however, the process would be too expensive.

Chemically, acetylene is an unsaturated compound, the first of an important series of hydrocarbons. It is said to be "unsaturated" because it combines with bromine and the other halogens without at the same time losing any of its own elements. It combines in a similar manner with hydrogen. By heating a mixture of acetylene and hydrogen, ethylene gas may be obtained, and this can be further transformed into ethane gas by the action of hydrogen in the presence of "platinum black" (finely divided platinum). Since from ethylene gas and ethane we can derive innumerable other compounds, it was a highly important problem to prepare acetylene itself directly from its elements. This problem solved, we could claim that we have been able to effect the complete synthesis of all those compounds; that is to say, that we can prepare them artificially without using any compound occurring ready formed in nature. The importance of the problem is due to the fact that it has been asserted that many such compounds could not be obtained artificially; that mysterious forces beyond human control could alone produce them. The French chemist Berthelot effected the interesting synthesis of acetylene by simply passing electric sparks between carbon poles placed in a vessel filled with hydrogen. Under such conditions the carbon of the poles combines directly with hydrogen to form acetylene.

In conclusion, another important property of acetylene may be mentioned. When acetylene is passed into a solution of a cuprous salt (say, cuprous chloride), containing some ammonia, a curious and characteristic compound of acetylene and copper is obtained, called *copper acetylide*. When a chemist is called upon to determine whether acetylene is present or absent in a given mixture, he tests it with a solution of cuprous chloride containing some ammonia; the formation of copper acetylide proves the presence of acetylene. It is currently believed that the explosive compound of copper and acetylene will form whenever acetylene comes in contact with metallic copper or its alloys. This idea has, however, been proved positively false; there is no danger whatever in storing acetylene in metallic vessels of any kind. Consult: V. B. Lewes, *Acetylene: a Handbook for the Student and Manufacturer* (New York, 1900). Caro, Ludwig, and Vogel, *Handbuch für Acetylen in technischer und wissenschaftlicher Hinsicht* (Braunschweig, 1904). A technical journal devoted to the acetylene industry (*Zeitschrift für Calciumcarbid-Fabrikation und Acetylen-Beleuchtung*) was established at Suhl in 1897 and has, since 1900, been published at Berlin.

ACHÆA, ȧ-kē'ȧ (Gk. Ἀχαῖα). (1) The southeast part of Thessaly, the legendary home of Achilles. (2.) The northern part of Peloponnesus, bordering on the Corinthian Gulf. The land rising gradually from the coast to the hills of the interior was famed in ancient times for fertility in production of oil, wine, and fruits, while the wooded mountains contained much game. In the modern kingdom of Greece Achæa forms a nome, or department, in the extreme northwest of the Morea, and its chief town is Patras. Excepting the west coast, the land is fertile, and produces corn, wine, and oil.

In early times the Achæans held more or less aloof from participation in the affairs of the rest of Greece. There were twelve principal towns, the names of which, according to Herodotus, were Pellene, Ægeira, Ægæ, Bura, Helice, Ægium, Rhypes, Patræ, Pharæ, Olenus, Dyme, and Tritæa, and these formed a confederacy, with Helice at the head. After the destruction of Helice by an earthquake in 373 B.C., Ægium took its place as the chief city of the confederacy. The wars and rivalries which prevailed after the death of Alexander the Great brought about the complete dissolution of the ancient bond, but a new union was formed in 280 B.C., which gradually extended itself, and in a few years comprised the ten cities, Patræ, Dyme, Pharæ, Tritæa, Leontium, Ægeira, Pellene, Ægium, Bura, and Ceryneia. This second confederacy was known as the Achæan League. It first came into prominence as an important factor in Greek and Hellenic politics in 249 B.C., when Aratus joined thereto his native city, Sicyon. The aim of the league was from this time forth to free the Greek peninsula from Macedonian rule. In 242 B.C. the Macedonian garrison was driven from Corinth, and this city was brought into the confederacy. Before the last quarter of that century the league had reached its most flourishing period of development. It included the whole of northern and middle Peloponnesus and many cities in other parts of Greece.

The government of the league affords perhaps the best example in antiquity of the federal system. In foreign affairs the union acted as a whole, but in internal affairs each city was a unit, and had equal rights with every other city. Also, each state still preserved its entire independence. There was a public council which met regularly twice every year, in spring and in autumn, and was attended, not by deputies, but in person by all male citizens of thirty years of age or over. The meeting-place of the council was at first a grove near Ægium, but later Philopœmen instituted a change, whereby meetings were designed to be held in rotation at the various cities belonging to the league. In this council the affairs of the league were brought up to be discussed and passed upon, and a record was kept of the proceedings. The chief officer of the league was the *strategos*, who had as subordinates a *hipparchos* and a *nauarchos*. There was also a secretary. The *strategos* was commander-in-chief of the army and general executive officer. He was assisted in the duty of calling together the assembly and presiding thereat by a board of ten *demiurgi*. For some years the league maintained its independence against all enemies. Something of the old power of Greece seemed to return, and there was a promise of permanent union; but it soon appeared that the league was bent on its own destruction. Instead of presenting a firm front against the common foes of Greece, its members were divided by continual discords. The Ætolian League was a formidable rival, and the Spartans, led by King Cleomenes III., pressed the confederacy so hard that Aratus was finally compelled to seek the alliance of the Macedonian king, Antigonus Doson.

This act was nothing less than the beginning of the dependency of the Achæan League on the Macedonian power. Another dangerous enemy was Rome. Led by the wise and energetic policy of Philopœmen, of Megalopolis, the Achæans held out against enemies at home and abroad for a number of years, but in 198 B.C. they were induced to ally themselves with the Romans. In 192 B.C. Philopœmen appeared at Sparta and compelled that city to join the league, and by the following year the whole of Peloponnesus had come over to the union. This power, however, lasted but a short time. The hostilities of Sparta, the intrigues of the Romans, and internal dissensions combined to bring about the fall of the confederacy. In 167 B.C. a wholesale deportation of leading Achæans to Rome as hostages took place. In 146 B.C. the Achæans were defeated at Corinth by the Roman general Mummius. This defeat not only dissolved the league, but destroyed the political independence of Greece. Southern and central Greece, under the name of Achæa, became a Roman province. Polybius, who was one of the Achæans taken to Rome as hostages in 167 B.C., has given an extended account of the league in his history of the period between 220 B.C. and 146 B.C. Consult: Schorn, *Geschichte Griechcnlands von der Entstehung actolischen und achäischen Bundes* (Bonn, 1833); Drumann, *Idecn zur Geschichte des Verfalls der griechischen Staaten* (Berlin, 1811); Hertzberg, *Geschichte Griechenlands unter den Römern* (Halle, 1875); and Freeman, *History of Fcderal Government* (second edition, London, 1893).

(3.) Under the Romans, the province containing all Greece except Thessaly and Macedonia.

ACHÆANS, ȧ-kē′anz (Gk. Ἀχαιοί, *Achaioi*). One of the races of ancient Greece. In Homer the name sometimes includes all the Greeks. The Achæans inhabited the southeastern part of Thessaly and much of the Peloponnesus. By the Dorian invasion they were crowded into the northwestern corner of the Peloponnesus, where they later formed the Achæan League. (See Achæa.) In mythology, their ancestor was Achæus, son of Xuthus and grandson of Hellen (q.v.).

ACHÆMENES, ȧ-kĕm′ė-nēz (Gk. Ἀχαιμένης, *Achaimenēs*), **ACH′ÆMEN′IDÆ**. The names of the progenitor and of the dynasty of ancient Persian kings, Cyrus, Cambyses, Darius, Xerxes, Artaxerxes, and their successors. The rule of the Achæmenidæ over Iran lasted 558-330 B.C. In the old Persian inscriptions Darius proudly traces his lineage back to *Haxāmanisiya* (in Greek, Ἀχαιμένης), as the founder of the royal line, and states that from him the family received the name Achæmenians.

ACHAIA. See Achæa.

ACHAMOTH, ăk′ȧ-mŏth. In the theological system of Valentinus (q.v.) the Gnostic, a personification of a form of wisdom inferior to the pure *sophia*. She is the mother of the world-maker, Demiurgus. See Demiurge.

ACHAQUA, ȧ-chä′kwȧ. An Indian tribe of Arawakan stock, which formerly inhabited the forests of the upper Orinoco region in northeastern Colombia. They were prominently mentioned in the last century, but were entirely uncivilized, practicing tattooing, polyandry, and the destruction of female infants. About 500 were still known to exist on the Rio Muco about the year 1850.

ACHARD, äG′ärt, Franz Karl (1753-1821). A German physicist and chemist, born in Berlin. He is remembered chiefly as the founder of the beet-sugar industry. He devoted several years to investigating the best methods of raising sugar-beets and of producing sugar on an industrial scale. Finally, at the instance of the King of Prussia, experiments were successfully carried out in Berlin about 1800, and as a result Achard was enabled to establish in 1801 the first sugar manufactory. He wrote *Die europäische Zuckerfabrikation aus Runkelrüben in Verbindung mit der Bereitung des Branntweins* (1812). Achard was for a time director of the class of physics in the Berlin Academy of Sciences, and published four volumes of *Vorlesungen über Experimentalphysik* (1790-92).

ACHARD, ȧ′shär′, Louis Amédée Eugène (1814-75). A French novelist. He was born in Marseilles, and was at first a merchant. He entered newspaper work in his native place; continued it in Paris, and went as a reporter to Spain with the Duc de Montpensier in 1846, and followed the French armies in 1870. But he is chiefly known as a novelist, his romances being numerous. Among them are *La belle rose* (1847); *Les misères d'un millionnaire* (1861); and *Histoire d'un homme* (1863). He also wrote several plays, among them *Histoire de mes amis* (1874).

ACHARNIANS, à-kär′nĭ-anz, The (Gk. 'Αχαρνεῖς, *Acharneis*). A comedy of Aristophanes (q.v.) produced in Athens at the festival of the Lenæa, 425 B.C., under the name of *Callistratus*. The title comes from the character of the chorus men of Acharnæ, an Attic deme near Mount Parnes, and the play is in opposition to the democratic policy of war with Sparta. Dicæopolis, the hero, is an honest farmer who is tired of the fighting and his attendant losses, and finally makes a private treaty with the Lacedæmonians. This leads to a farcical but brilliant display of the contrasts between the discomforts of war and the joys of peace.

ACHATES, à-kā′tēz (modern Dirillo). (1.) A river in southern Sicily that gave its name to the agate (*achates*) which was found there, according to Pliny (37, 139). (2.) A faithful companion of Æneas in his wanderings (Vergil, *Æneid*, i., 188), whence the name *fidus Achates* applied to any faithful friend.

ACHEEN, à-chēn′. See Achin.

ACHELOUS, ăk′ē-lō′ŭs (Gk. 'Αχελῷος, *Achelōos*, now called Aspropotamos, i.e., White River, from the cream color of its waters). The largest river in Greece (Map: Greece, C 5). It rises in Mount Pindus, flows southward, separating Ætolia from Acarnania, and falls into the Ionian Sea. It is over 100 miles long, and unnavigable.

ACHENBACH. The name of the two most celebrated landscape painters of the Düsseldorf School. Andreas (1815—), the elder, was born at Cassel, September 29, 1815. He was the first great realist in landscape, modelling his art upon the Dutch painters of the seventeenth century. His vision was clear and sober, but he lacked appreciation of the sentiment in nature. His principal works include "Hardanger Fjord" (1843, Düsseldorf), "The Pontine Marshes" (1846, Munich), and "The Fish Market at Ostend" (1866, Berlin). He was represented at the World's Fair in St. Louis by "Low Tide." His works are numerous in the private galleries of the United States, and he is represented in the Metropolitan Museum, New York, and in the Pennsylvania Academy at Philadelphia. His brother and pupil Oswald (1827—) was born at Düsseldorf, February 11, 1827, and studied at the Düsseldorf Academy. His journey to Italy in 1850-51 determined the character of his subjects, which are Swiss and Italian. Although his style is more ideal than his brother's, it is less powerful. His principal works include: "A Funeral at Night in Palestrina" (1859, Düsseldorf), the "Gulf of Naples" and other subjects (1880, Dresden). His paintings are also numerous in the United States, and he was represented at the World's Fair in St. Louis by "Sea at Sunrise," "The Arch of Constantine," and "Lake Nemi."

ACHENE, à-kēn′, also Achenium and Akene (Gk. ἀ, *a*, priv. + χαίνειν, *chainein*, to gape). A seed-like fruit such as is characteristic of the great family of Compositæ, to which belong sunflowers, thistles, dandelions, etc. The pits of the strawberry and the small fruits forming a head in the centre of a buttercup are also achenes. The seed-like appearance arises from the fact that the wall of the seed-vessel hardens and invests the solitary seed so closely as to seem like an outer coat. See Fruit.

ACHENSEE, äG′en-zā. A lake in north Tyrol, Austria, 20 miles northeast of Innsbruck. It is 5½ miles long and a half mile broad. Its picturesque shores dotted with hotels and villas are much frequented as summer resorts. Steamers ply on its waters.

ACHENWALL, Gottfried (1719-72). One of the most influential German economic and political scientists of the 18th century. Besides works on natural law, history, and political science, he was author of an important treatise entitled *Staatsverfassung der heutigen vornehmsten Europäischen Reiche* (1752), in which he treated not only the political constitutions, but the economic and social condition of the principal nations. His method was statistical, and the effect of his work was to popularize the use of statistics in Germany. Certain of his disciples claimed for him the title of founder of statistical science; but such a claim cannot be defended in view of the priority of Patty, Couring, and other writers in the use of this method.

ACHERON, ăk′ē-rŏn (Gk. 'Αχέρων, *Acherōn*). The name given to several rivers by the ancients. The best known is the Acheron in Thesprotis, which flows through the lake Acherusia, and pours itself into the Ionian Sea. According to Pausanias, Homer borrowed from the river in Thesprotis the name of his infernal Acheron. In the later poets and mythographers Acheron is the name of a river or lake in the lower world across which the souls of the dead were obliged to pass. (See Styx.) The lake Acherusia in Thesprotis was regarded as an entrance to the lower world, and the name was also applied to a walled enclosure near a temple at Hermione in Argolis, and a promontory near Heracleia in Pontus.

À CHEVAL (à′shẹ-väl′) **POSITION** (Fr. *à cheval*, on horseback). A military term to denote the position of an army where a river or highway separates considerable portions of the troops and is perpendicular to the front. When the perpendicular to the front is formed by a river, possession of a bridge is necessary in order to secure the effective co-operation of the troops on both sides.

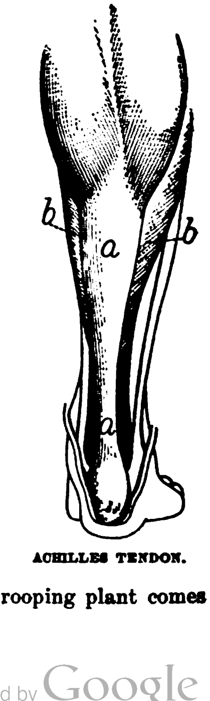
ACHILL, ăk′ĭl, or **EAGLE ISLE**. An island off the west coast of Ireland, in the county of Mayo. It is 15¼ miles long by 12½ miles broad, and has several mountains composed of mica slate, about 2000 feet high. There are several villages. Population about 5000.

ACHILLEA, ăk′ĭl-lē′à (Lat. *achillēos*, milfoil, yarrow, said to have been discovered by Achilles). A genus of plants of about eighty species, of the natural order Compositæ, having small flowers disposed in corymbs, and the receptacle covered with chaffy scales. The florets of the ray are fertile, and have a short, roundish tongue or lip; the florets of the disk are hermaphroditic, the tube of the corolla flatly compressed and two-winged; the involucre is imbricated. The common Yarrow or Milfoil (*Achillea millefolium*) abounds in all parts of Europe and in many parts of North America, growing to about a foot in height. It has white or rose-colored flowers. The leaves have a bitterish, aromatic taste, and little smell; the flowers have a strong, aromatic smell, with an aromatic bitter taste, and contain an essential oil, a resin, bitter extractive, gum, several salts, and traces of sulphur. Both leaves and flowers are used in medicine as a powerful stimulant and tonic. The leaves were formerly much used for healing wounds, and are still so employed by the common people in the Highlands of Scotland and in some parts of the Continent of Europe. The expressed juice is a popular spring medicine in Germany. Yarrow is often sown along with grasses intended to form permanent pasture for sheep, but in the United States it is generally considered a weed in pastures. Achillea moschata, called Musk Milfoil, is cultivated as food for cattle in Switzerland. Achillea moschata, atrata, and nana—all natives of the Alps—are very aromatic, and bear the name of Genipi or Genip. The inhabitants of the Alps value them very highly, and use them for making what is called Swiss tea. Achillea nana is said to be used in making chartreuse. They are very stimulating and tonic; as are also Achillea setacea and Achillea nobilis, both natives of Switzerland and other middle parts of Europe, and Achillea ageratum, a native of the south of Europe, used by the French as a vulnerary, and called *herbe au charpentier*. Sneezewort (*Achillea ptarmica*) is a native of Europe, and somewhat introduced into the United States, one to three feet high, with lanceolate leaves, and much larger flowers than the common Milfoil. It grows in meadows and damp places. The root, which is aromatic, is used as a substitute for Pellitory of Spain, and the whole plant is pungent and provokes a flow of saliva.

ACHILLES, ȧ-kĭl′lēz (Gk. *'Αχιλλεύς, Achilleus).* The hero of Homer's *Iliad*, and the type of glorious youth. In the Homeric poems his story is simple. The son of King Peleus and the sea-goddess Thetis, he was brought up at his father's court in Phthia until induced to take part in the Trojan War, preferring an early death with fame to a long but inglorious life. This fate gives Achilles a tinge of melancholy characteristic of the Greek mind. While the Greeks were in camp before Troy, Achilles plundered the surrounding country and secured as his booty the beautiful Briseïs. The *Iliad* narrates the wrath of Achilles because Agamemnon deprived him of his fair slave to replace Chryseïs, whom he had been forced to restore to her father in order to avert the wrath of Apollo from the Greeks. In the absence of Achilles the Trojans drive the Greeks to their ships, and their destruction is averted only when Achilles allows his friend, Patroclus, to lead his Myrmidons to the rescue. Pursuing the Trojans to their walls, Patroclus is slain by Hector, and Achilles, overwhelmed with grief, becomes reconciled with Agamemnon, that he may hasten to obtain revenge. He returns to the fight, and after driving the Trojans within the city, slays Hector and drags his body to the ships. After celebrating the funeral of Patroclus with great pomp, he yields to the command of Zeus and allows Priam to ransom the body of his son. In the *Odyssey* we have allusions to the death of Achilles, his splendid burial, and the renown of his son, Neoptolemus. Later epic poems and other compositions add many details. According to some, his mother rendered him invulnerable by dipping him in the River Styx; but his heel, by which she held him, was not immersed, and here he received his death wound from an arrow. He was educated by the centaur Chiron, and was afterward hidden by his mother at Scyros, among the daughters of Lycomedes. He was needed, however, in the expedition against Troy, and was detected by the craft of Odysseus, who offered a sword, as well as trinkets, to the maidens. When a trumpet sounded an alarm Achilles at once seized the sword, and, being recognized, was then easily induced to join the Greeks. His combats with Penthesilea, Queen of the Amazons, and with Memnon (q.v.), who came to aid Priam after the death of Hector, were favorite subjects with Greek artists. He met his death at the hands of Apollo and Paris before the Scæan gate, or in the temple of Apollo, where he had gone to meet Polyxena, daughter of Priam. She was slaughtered on his grave after the capture of Troy. After his death he was transported to the Islands of the Blessed, where he was united with Medea. Achilles was worshiped in Laconia and other parts of Greece, and it is probable that, like other Greek heroes, he was originally a god, honored especially by the Achæans of Phthiotis. See the articles HOMER and TROJAN WAR.

ACHILLES TATIUS, tā′shĭ-ŭs (Gk. *'Αχιλλεύς Τάτιος, Achilleus Tatios*). A Greek writer, a native of Alexandria, who probably lived in the fifth or sixth century A.D. He was the author of a romance in eight books, entitled *The History of Leucippe and Clitophon*, in which he borrowed freely from the work of his predecessor Heliodorus, by whom alone he was surpassed in popularity. While his work is graceful in style, it is inferior to that of his model; and for us it is marred in passages by the grossest pagan immorality. It was, however, freely imitated by later writers, especially by Eustathius and Nicetes Eugenianus in the Byzantine period. Suidas says that the author became a Christian and attained to the office of bishop, but the truth of his statement is doubtful. The work has been edited with commentary by Jacobs (Leipzig, 1821); Hirschig (Paris, 1856); Hercher (Leipzig, 1858). Consult Rohde, *Der griechische Roman und seine Vorläufer* (Leipzig, 1876).

ACHILLES TEN′DON (Lat. *Tendo Achillis*). A tendon (*a*) which attaches the soleus (*b*) and gastrocnemius muscles of the calf of the leg to the heel-bone. It is capable of resisting a force equal to 1000 pounds weight, and yet is occasionally ruptured by the contraction of these muscles in sudden extension of the foot. The name was given with reference to the death of Achilles by a wound in the heel.



ACHILLES TENDON.

ACHIMENES, ȧ-kĭm′ē-nēz (probably from Lat. *Achæmenis*, Gk. *ἀχαιμενίς*, *achaimenis*, an amber-colored plant in India used in magical arts). A genus of plants of the order Gesneraceæ (q.v.), much cultivated as a greenhouse herb. The species are numerous—natives of tropical America. Achimenes is propagated either by the natural increase of the rhizome or by cuttings. If the rhizomes are potted by April 1, the drooping plant comes into blossom by the last of May and continues to bloom without cessation for four or five months. The corolla tube is cylindrical and the limbs are spreading. The blossoms are red, blue and white, with all intermediate shades.

ACHIN, à-chēn′, or **ATCHEEN**. A Dutch dependency of about 20,000 square miles area, with a population numbering approximately 110,000, at the north end of Sumatra, famed from ancient times as part of the Golden Chersonese. The country is mountainous and intersected with many rivers. The famous Gold Mountain, 6000 feet high, is at the extreme northern point, with the capital city of Achin at its base.

The shorter stature, darker color, etc., of the aborigines of Achin has led some authorities to separate them from the Sumatrans in general, and their language is by others held to be Polynesian rather than Malay at bottom. While undoubtedly Malays, the Achinese, like several other peoples of the East Indies, may have a strain of Arab blood. In the seventh century the Hindu missionaries introduced civilization, and many emigrants from India settled here. In the thirteenth century the people were converted to the faith of Islam, the sultans of Achin claiming descent from the first Mohammedan missionary. When in the sixteenth century Europeans reached Achin, they found astonishing wealth. The Achinese sent an embassy to the powerful Dutch republic, and the envoys had audience of Prince Maurice in his camp before Grave in 1602. The Dutch kept up intermittent trade intercourse with them until 1811, when Sumatra was ceded to the British. When the Dutch regained nominal possession, Great Britain stipulated that none but British citizens should reside in Achin, and that the Dutch should not conquer the little kingdom, the English wishing to retain the commerce. The piratical instincts of the Achinese, however, led them into conflicts with the Dutch, who found it necessary to chastise them. In 1871, by the Hague Treaty, the British withdrew their reservation, and the Dutch sent an expedition in 1873 to capture the chief city and invade the country. They were beaten in this, as well as in other expeditions, and the country was not pacified until the year 1880, when a civil government was instituted. The Achin wars have cost the Netherlands 12,000 lives and nearly one hundred million dollars for blockade and naval and military operations, and the country is yet practically unsubdued in the interior. This is not merely owing to the fanatical spirit of independence in the natives, but also and more because Achin furnishes a rich and tempting field for British blockade runners. There was an outbreak in 1901. There are numerous works in Dutch treating of Achin, and there are in Holland many monuments and trophies of the war. Besides the historical work of Veth, *Atchin* (Leyden, 1873), the standard treatise on the Achinese is Snouck, *De Ajehers* (two volumes, Batavia, 1893-95).

ACHMET, ăk′mĕt. See AHMED.

ACHMET, ăk′mĕt, or **AHMED**, äh′mĕd. The name of three sultans of Turkey, of whom Achmet III. (reigned 1703-30) was the most famous. It was this sovereign who sheltered Charles XII. after his defeat at Pultowa in 1709. He wrested the Morea from the Venetians in 1715. Having invaded Hungary, he was defeated by Prince Eugene at Peterwardein in 1716, and later near Belgrade, and compelled to cede to Austria, by the treaty of Passarovitz, 1718, Belgrade, the Banat, and other territories. The soldiers drove him from the throne in 1730, and he died in prison in 1736.

A′CHOR. A valley which forms the northern boundary of Judah (Joshua xv : 7) near Jericho. Its identification is uncertain, though Wady-el-Kelt has been suggested, which, however, is not broad enough to become "a place for the herds to lie down in" (Isaiah lxv : 10).

ACHO′RION. See FAVUS.

ACHRAS, ăk′răs. See BLACK BULLY.

ACHROMATIC, ăk′rō-măt′ĭk. See TELESCOPE.

ACHRO′MATISM (colorlessness, from Gk. ἀ, *a* priv. + χρῶμα, *chrōma*, color). The property by virtue of which certain combinations of lenses and prisms refract a beam of white light without producing dispersion of certain colors. (See DISPERSION.) Newton, misled by imperfect experiments, concluded that dispersion could not be annulled without annulling refraction. Hall, in 1733, and later, Dollond (independently), found that certain media have large powers of refraction with small dispersion, while others give small refraction with large dispersion; so that the dispersion of two colors produced by one medium can be corrected by that due to another, while the deviation of the light from its original direction is not entirely annulled. For example, by properly combining a convex lens of crown-glass with a concave one of flint-glass an "achromatic lens" can be produced which will have the same focus for the two selected colors, while the foci for the other colors are at neighboring points along the axis of the lens. It is thus seen that the achromatism in the above arrangement is not perfect. In Fig. 1 a beam of white light having the direction *c d* meets the crown-glass prism and is refracted. Dispersion also takes place, and the beam as it emerges is separated into its component colors. Adjacent to the prism of crown-glass is one of flint-glass, whose action is to bring together the rays so that they emerge parallel, with the desired deviation. The reason is that prisms of different media do not give exactly similar spectra, the colors being dispersed according to different laws for different media. Fig. 2 shows achromatic combinations of lenses where the flint and crown glasses are combined with the same effect as in the achromatic prism illustrated. A combination of three lenses, or prisms, gives a better approximation to absolute achromatism than a combination of two.

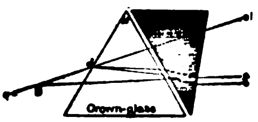


Fig. 1.
ACHROMATIC PRISM.

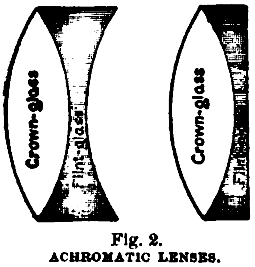


Fig. 2.
ACHROMATIC LENSES.

If a lens is to be used for visual observations, it is "corrected" generally for a definite wave-length in the yellow and one in the bluish-green, *i.e.* these two colors are brought to the same focus; but if it is to be used for photographic purposes, it is "corrected" for two wave-lengths, which include those radiations possessing the greatest photographic action. There are two defects which a lens may have, owing to chromatic aberration (q.v.), in that the colored images may be at different distances from the lens and that they may be of different sizes. The second of these defects is insignificant if the lens is thin; and the first may be "corrected," as just described, by combining two thin lenses. If the lens is thick, or if the lenses of the lens-system are some distance apart, the second of the above mentioned errors becomes serious. It may, however, be corrected.

ACHTERMANN, äɢ'ter-män, Theodore Wilhelm (1799-1884). A German sculptor. In his sculptures he devoted himself principally to New Testament subjects. While at Rome, in 1841, he prepared a statue of Christ and an "Ecce Homo" for the Duke of Aremberg. His most celebrated productions are preserved in the cathedral at Münster, and consist of a "Pietà" and a "Descent from the Cross." Another admirable work is the marble altar on which are depicted three episodes from the life of Christ (in relief), prepared in 1873 for the cathedral at Prague.

A CHULA, à-shōō'là (Portug.). A dance similar to the fandango (q.v.).

ACHURCH', Janet. The stage name of Janet Achurch Sharp, an English actress, the wife of Mr. Charles Charrington. She was born in Lancashire and first appeared in London at the Olympic Theatre in January, 1883. In 1887 she joined Beerbohm Tree's company, and at the Novelty Theatre, June 7, 1889, created in English the part of Nora Helmer in *A Doll's House*. This was the first presentation of an Ibsen play to the English public. She has since toured with a company in India and Australia, and appeared in the United States with Richard Mansfield (1895), and independently. In June, 1897, at the Olympic Theatre, London, she took the Shakespearean part of Cleopatra, and she appeared later in some of Bernard Shaw's plays.

ACHZIB, äk'zĭb. (1). A Phœnician city claimed by Asher (Joshua xix : 29), but not conquered (Judges i : 31); the modern Ez-Zib on the promontory of Ras-en-Nakurah. Achzib is mentioned by Sennacherib. (2) A town in the Shephelah of Judah (Joshua xv : 44). Possibly the modern 'Ain-el-Kezbeh, near Bet-Nettif.

ACIDASPIS, ăs'ĭ-dăs'pĭs (Gk. *ἀκις*, *akis*, spine + *ἀσπίς*, *aspis*, shield). A peculiar genus of trilobites found in rocks of Silurian and Devonian age in nearly all parts of the world. The individuals are, as a rule, small, and are remarkable because of the spiny ornamentation of the dorsal shield or carapace. The lobation of the head shield is rather peculiar and quite unlike that seen in any other genus of trilobites, the trilobite division being obscured by a number of supplementary furrows and by the strong development of two longitudinal false furrows between the normal dorsal furrows. The thorax contains nine or ten segments, and the tail-shield is of rather small size. In some species a row of slender spines is developed upon the sides of the head-shield and a long spine projects from each posterior angle. Besides these there are often two long straight or curved spines directed upward and backward from the middle posterior edge of the head. Each segment of the thorax is produced laterally into long spines, and there are also two short spines on the raised median portion of each segment. The tail-shield is in nearly all species likewise furnished with spines, so that on the whole these animals must, though of small size, have presented a rather formidable aspect to larger animals which sought to prey upon them. A few species of the genus are of particular interest on account of the abnormal development of the eyes, which are placed at the summits of highly elevated slender, though immovable, stalks, which arrangement enabled the animal to command a view in all directions. This elevation of the eye recalls the stalk-eyes of some modern crabs and lobsters. For illustration, see Plate of Trilobites.

ACIDIMETRY, ăs'ĭ-dĭm'ē-trĭ (Lat. *acidus*, sour + Gk. *μέτρον*, *metron*, measure). The determination of the amount of acid contained in a solid or liquid substance. When the compound is a solid, the determination is usually made by the gravimetric method, which consists in the dissolving of a known weight of the material, and its subsequent treatment by such reagents as will yield an insoluble compound, from the weight of which the amount of acid can be calculated. When the substance is a liquid, free from foreign matter, the proportion of acid may be ascertained by determining the specific gravity of the solution by means of a hydrometer, but in case of mixtures the acidity of a solution is best ascertained by the volumetric method, which is described under Alkalimeter.

ACIDS, ăs'ĭdz (Lat. *acidus*, sour). A large and important class of chemical substances. They all contain hydrogen, part or all of which is replaced by metals when the acids are brought in contact with metallic hydroxides. The compounds formed by substituting metals for the hydrogen of acids are termed the salts of those metals, and therefore the acids themselves may be regarded as salts of hydrogen. An example may render these definitions more clearly intelligible. When the sour principle of vinegar is brought in contact with potassium hydroxide, a reaction ensues, resulting in the formation of a new substance. A chemical analysis, combined with a determination of the molecular weight of the sour principle of vinegar, shows that the molecule of the latter must be represented by the formula $C_2H_4O_2$; on the other hand, the substance formed with potassium hydroxide is represented by the formula $C_2H_3KO_2$. Evidently, part of the hydrogen of the sour principle of vinegar has been replaced by the metal potassium (K). We therefore class the sour principle of vinegar with the acids (it is the well-known acetic acid); and we class the substance obtained by its action on potassium hydroxide with the salts (it is called the acetate of potassium, while acetic acid itself may be called the acetate of hydrogen).

Most acids have a sour taste and change the blue color of litmus to red. These properties, however, are not strictly characteristic of acids, silicic acid, for instance, possessing neither, though—like a true acid—it combines with metallic hydroxides to form salts.

According to the maximum number of their hydrogen atoms replaceable by metals acids are termed mono-basic, di-basic, tri-basic, etc. No matter how great the excess of potassium hydroxide employed, only one hydrogen atom of acetic acid, $C_2H_4O_2$, can be replaced by potassium, the only resulting salt having the formula $C_2H_3KO_2$. Acetic acid is, therefore, said to be a mono-basic acid. By the action of a limited amount of potassium hydroxide on sulphuric acid (H_2SO_4) a salt called the acid sulphate of potassium ($HKSO_4$) may be obtained; this salt is formed by substituting the metal potassium for one of the hydrogen atoms of sulphuric acid. But if an excess of potassium hydroxide is used, both of the hydrogen atoms of sulphuric acid are replaced by potassium, and the salt known as the neutral sulphate of potassium (K_2SO_4) is produced. Sulphuric acid is therefore said to be a di-basic acid. In like manner phosphoric acid (H_3PO_4) is found to be a tri-basic acid, etc.

Acids containing carbon among their constituent elements are called organic acids, because some of them were originally found in the organic world. Most organic acids are found to contain one or more carboxyl groups (COOH); it is the hydrogen of these groups that is replaceable by metals. These acids are called carboxylic acids, and their basicity is determined by the number of carboxyl groups they contain. The carboxylic acids are subdivided into carbocyclic and fatty acids, according as their molecules do or do not contain those rings of which the so-called aromatic benzene-nucleus is the most important. Thus benzoic acid, C_6H_5COOH, is a carbocyclic acid; acetic acid, CH_3COOH, is a fatty acid. An interesting group of substances belonging to the aromatic series and, like acids, combining with metallic hydroxides, are not included among the true aromatic acids because they do not contain the carboxyl group. These substances, called phenols (q.v.), are found to be weaker than the weakest carboxylic acid known, viz., carbonic acid.

The specific strength of an acid depends, naturally, on its composition and chemical constitution. But the precise nature of that relation is as yet unknown. The correctness of the very methods of measuring the strength of acids is, according to some eminent authors, still subject to doubt. It is, however, remarkable and cannot be denied, that the different methods employed yield very nearly coincident results.

One of those methods consists in determining the avidity of acids for a metallic hydroxide, as shown by the proportion in which the latter is distributed between two acids when brought in contact with a mixture of the two, the amount of metallic hydroxide employed being insufficient to saturate both acids completely. For example: sodium hydroxide, sulphuric acid, and nitric acid are weighed out in such quantities that the sodium hydroxide is just sufficient to neutralize either one of the two acids. When the three substances are now mixed together in aqueous solution, it is found that two-thirds of the sodium hydroxide have been taken up by the nitric acid and only one-third by the sulphuric acid. The conclusion is drawn that nitric acid is twice as strong an acid as sulphuric acid. It is similarly found that hydrochloric acid, too, is twice as strong as sulphuric acid, and hence possesses the same strength as nitric acid. Acetic acid is found to be very weak.

Another interesting method of determining the relative strength of acids consists in measuring the rapidity with which various acids are capable of effecting the inversion of sugar; that is to say, the decomposition of sugar into dextrose and levulose, a reaction taking place under the influence of acids, according to the following equation:

$$\underset{\text{Cane-sugar}}{C_{12}H_{22}O_{11}} + H_2O = \underset{\text{Dextrose}}{C_6H_{12}O_6} + \underset{\text{Levulose}}{C_6H_{12}O_6}$$

For example, if equivalent quantities of nitric and hydrochloric acids are added to two equal portions of a solution of cane-sugar, it is found that, under the same conditions of temperature and concentration, the inversion takes place with equal rapidity in both cases; the conclusion is drawn that nitric and hydrochloric acids are equally strong acids. It is similarly found that these acids are about twice as strong as sulphuric acid, while acetic acid is found to be very weak.

When an acid is dissolved in water, its molecules are assumed to become dissociated into ions, some of which are charged with positive, some with negative, electricity. Thus acetic acid is supposed to break up according to the following equation:

$$\underset{\text{Acetic acid}}{CH_3COOH} = \overset{+}{H} + \overset{-}{CH_3COO}$$

The dissociation is usually incomplete; that is to say, only a fraction of the amount of acid in solution is dissociated into ions, the rest remaining undissociated. So that a solution of acetic acid, for instance, contains three kinds of particles, viz., (1) positive hydrogen ions, $\overset{+}{H}$; (2) negative ions, $\overset{-}{CH_3COO}$; and (3) electrically neutral (undissociated) acetic acid molecules, CH_3COOH. The magnitude of the fraction dissociated, or, as it is called, the degree of dissociation of an acid, depends (a) upon the amount of acid in solution; (b) upon the temperature; and (c) upon the nature of the acid. Under the same conditions of concentration and temperature the number of free ions in solutions of different acids depends upon nothing but the nature of the acids. And as according to the electrolytic theory the capacity of an acid for conducting electricity depends upon nothing but the presence of free ions in its solution, the electrical conductivity of the solution may be taken as a measure, so to speak, of the nature of the acid.

Now, when the acids are tabularly arranged in the order of their electrical conductivity, it is found that the order is the same as when they are arranged according to their avidity for metallic hydroxides, or when they are arranged in the order of the rapidity with which they can effect the inversion of cane-sugar.

A remarkable relation is thus seen to exist between three phenomena having apparently no connection with one another. The common cause of these phenomena is assumed to be the presence of free hydrogen ions in an acid solution. Furthermore, on this assumption the neutralization of acids by metallic hydroxides is explained in the following manner. The fact that pure water is a non-conductor of electricity proves that its molecules are not dissociated into ions. If ions formed by the elements of water meet in a solution, they must immediately combine to form undissociated molecules of water. Now, while the solution of an acid contains electro-positive hydrogen ions, $\overset{+}{\mathrm{H}}$, the solution of a metallic hydroxide contains electro-negative hydroxyl ions, $\overset{-}{\mathrm{OH}}$. When the solutions are mixed, these ions combine into neutral molecules of water, according to the following equation:

$$\overset{+}{\mathrm{H}} + \overset{-}{\mathrm{OH}} = \underset{\text{Water}}{\mathrm{H_2O}}$$

The disappearance of free hydroxyl and hydrogen ions as such causes the simultaneous disappearance of the properties both of the basic hydroxide and of the acid; and the acid and base are said to have neutralized each other.

ACIREALE, ä′chā-rā-ä′lā (Sicil. *Iaci*). A city in Sicily, 525 feet above the sea, at the mouth of the River Aci, which descends from Mount Etna to form a small harbor here, 9 miles northeast of Catania (Map: Italy, K 10). The broad streets, spacious houses, and high towers rest on beds of lava, from which many of them were constructed. The climate is considered very healthful, and in summer the Terme di Santa Venere offers baths of tepid mineral water containing sulphur, salt, and iodine. There are pleasant walks and drives to neighboring villages on the slopes of Mount Etna, and the grotto of Galatea and the cave of Polyphemus are in the neighborhood. The coast south of Acireale is steep, and has risen more than 40 feet during the historical period. In the sea near by rise the Scogli de' Ciclopi, the rocks which according to tradition were hurled after the wily Ulysses by the blinded Polyphemus. The most beautiful of them is about 230 feet high and 2300 feet in circumference, and consists of basalt containing wonderful crystals and covered with hard limestone that carries fossil shells. The city has a gymnasium and a technical school, and one of the old families possesses a splendid collection of Sicilian coins. The manufactures are silk, linen, and cotton goods, knives and shears, and there is an important commerce in flax and grain. Pop., 1901, 35,418.

A′CIS (Gk. Ἄκις, *Akis*). A small stream flowing from the foot of Mount Etna in Sicily. Legend derived the name from Acis, son of Faunus and Symæthis, beloved by the nymph Galatea. The Cyclops Polyphemus, jealous of the boy, crushed him under a rock, and his blood, gushing forth, was changed into the river. See GALATEA.

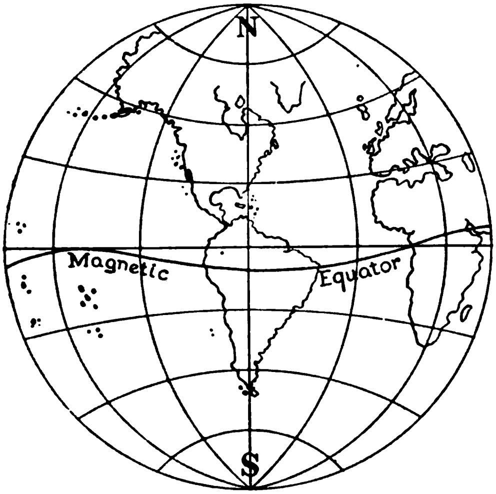
A′CIS AND GAL′ATE′A. The title of a pastoral serenata or cantata composed by Handel and produced about 1720. The words are by Gay, Pope, and Hughes. It was acted as an opera at the Haymarket Theatre, London, in 1732, without the consent of the composer, and has been since repeated at Drury Lane.

ACKERMANN, ăk′ẽr-män, KONRAD ERNST (1712-71). One of the founders of German dramatic art. He began his career as an actor with the famous Schönemann company at Lüneburg in January, 1740. Upon the outbreak of the disastrous Seven Years' War he sold a theatre he had erected in Königsberg, and the loss thus entailed compelled him thenceforth to lead a wandering life with his troupe. On July 31, 1765, he opened a new theatre at Hamburg, which, according to Lessing, eventually set the standard for theatrical performances in Germany. Besides the members of his own family, the companies organized by Ackerman included some of the ablest talent in Germany. The theatre was conducted by him until 1767, when it passed into the hands of twelve citizens of Hamburg, and was thereafter known as the *Deutsches Nationaltheater*. Ackerman's representations were models of freshness and vigor, and although he lacked qualifications requisite for heroic and emotional parts, his acting of many character rôles was remarkable.

ACKERMANN, RUDOLPH (1764-1834). A German-English inventor and publisher. He was born at Schneeberg, Saxony, and followed the occupation of coach builder and saddler in various German cities, as well as in Paris and London. He established an art school in London in 1795. In 1801 he patented a method of rendering paper, cloth, and other fabrics waterproof, and for this purpose erected a factory at Chelsea, England. He also contributed greatly to the development of lithography. It is, however, as a publisher of fine art subjects that Ackermann is best known. His greatest achievement in this field was the *Repository of Arts, Literature, Fashions, Manufactures, etc.*, a publication which was continued regularly until 1828, when forty volumes had appeared. Many of the plates were supplied by Rowlandson and other eminent artists. Among his other numerous illustrative works is *The World in Miniature* (43 volumes, 12mo, 637 plates, 1821-26).

ACKNOWL′EDGMENT. (1.) An admission by a person that he is owing a debt or is subject to a liability, which, but for such acknowledgment, would be barred by the statute of limitations. It need not be in any set form of words, but it must be a clear admission of an identified liability, and modern statutes often require it to be in writing. (2.) The term is also applied to the formal act of declaring, before a notary public or other proper officer, that a written instrument executed by the declarant is his act and deed. It is applied also to the certificate of the officer setting forth the facts connected with such declaration. An acknowledgment is not essential to the validity of an instrument, unless made so by statute, although by recording acts (q.v.) it is generally required in order that the instrument may be lawfully recorded. In England and in many of our States, a deed of conveyance or release of dower by a married woman is declared invalid by statute, unless, upon an examination apart from her husband, she acknowledges that she executed the deed of her own free will. Such a conveyance has taken the place of the conveyance by fictitious suit, known as a fine (q.v.). The object of this legislation has been declared by the United States Supreme Court to be twofold: not only to protect the wife by making it the duty of the officer taking the acknowledgment to certify that she has not acted under compulsion of her husband, or in ignorance of the contents of the deed, but also to facilitate the conveyance of the estates of married women, and to secure and perpetuate evidence upon which innocent grantees as well as subsequent purchasers may rely that the requirements of the statute necessary to give validity to the deed have been complied with. Such an examination and certificate is a *quasi*-judicial act, and can be impeached and invalided only for fraud. Judges, clerks of courts, mayors, notaries public, commissioners of deeds, and justices of the peace are authorized in most States to take acknowledgments. The laws of the State in which the acknowledgment is to be used determine its sufficiency. For forms of acknowledgments consult Hubbell, *Legal Directory for Lawyers and Business Men* (New York, revised annually); Abbott's *Forms* (New York). See Deed and the authorities referred to.

AC'LAND, Christian Henrietta Caroline (1750-1815). Commonly known as Lady Harriet Acland, the wife of John Dyke Acland, an English officer in the American revolution. She was married in 1770, and in 1776 accompanied her husband, then commander of grenadiers, to America, and with him endured most of the hardships of the Burgoyne campaign. Major Acland became dangerously ill in Canada, but was nursed back to health by her, and was again tenderly cared for by her after being wounded in the battle of Hubbardton (July 7, 1777). In the second battle of Saratoga (October 7, 1777) he was severely wounded and became a prisoner in the hands of the Americans. Lady Acland, hearing of this, bravely entered the American camp, where she was received with the utmost courtesy. She rejoined her husband at Albany, and nursed him until his wounds had healed, when she returned with him to England. Major Acland died in 1778, as the result of a cold contracted while fighting a duel to vindicate the courage of the Americans, and Lady Harriet, contrary to the usual accounts, did not marry again. Consult: Stone, *Sketch of Lady Harriet Acland*, in *Ballads and Poems Relating to the Burgoyne Campaign* (Albany, 1893).



ACLINIC LINE.

ACLAND, Sir Henry Wentworth Dyke (1815-1900). An English physician. He was born at Exeter and was educated at Oxford. He was one of the founders of the Oxford University Museum, and in 1859 published, with Ruskin, an account of the aims of that institution. He accompanied the Prince of Wales to America in 1860. In 1894 he tendered his resignation as regius professor of medicine at Oxford, which position he had occupied since 1858. His more important publications included the *Memoir on the Visitation of the Cholera in Oxford in 1854*, and *Village Health* (1884).

ACLAND, John Dyke. See Acland, Christian Henrietta Caroline.

ACLIN'IC LINE (Unbending, unwavering, from Gk. ἀ, *a*, priv.+ κλίνειν, *klinein*, to incline). This is an imaginary line around the earth between the tropics where the magnetic needle has no inclination; that is, where, when balanced free to turn in any direction, it places itself horizontal. It is called the magnetic equator, and is about 90 degrees from the magnetic poles. The line is variable and irregular. In 1901, in the Western Hemisphere, it was south, and, in the eastern, north, of the geographical equator. See Magnetism, Terrestrial.

AC'MITE (Gk. ἀκμή, *akmē*, point, edge). A sodium-iron silicate that crystallizes in the monoclinic system, has a vitreous to resinous lustre, and is red to brown and green in color. It occurs in the older rocks in Sweden and Greenland, and in the United States minute crystals have been found in northwestern New Jersey, while fine prismatic crystals, frequently eight inches in length, occur at Hot Springs and Magnet Cove, Ark. It is called acmite from the sharp pointed extremities of its crystals.

AC'NE (probably from Gk. ἀκμή, *akmē*, a point). An inflammatory structural disorder of the sebaceous glands or follicles of the skin (q.v.). Dust plugs the outlets of some follicles, forming "black heads" or comedones. Retention of the sebum causes irritation of the follicle, leading to increased secretion and congestion of the surrounding tissue. Pressure with a watch key or the finger nails causes expulsion of the sebum in a little spiral white mass, with a black point or anterior end, erroneously regarded as a worm. In the midst of the white mass of sebaceous matter, a parasite, *Acarus folliculorum*, is, however, often found. Some points suppurate and some intermediate follicles become inflamed, and pimples (papules), as well as hardened masses, appear. This variety of acne is called Acne vulgaris. Anæmia, dyspepsia, constipation, and uterine disorders may be the indirect causes of acne, the immediate cause being the entrance of the Staphylococcus pyogenes (the germ of suppuration) into the sebaceous follicles. Treatment must be directed against the indirect causes mentioned, and also vigorous local treatment must be employed. Internal remedies include aperients, mineral waters, cod liver oil, hypophosphites, malt extract, arsenic, iron, mercury, and sulphur. External remedies include salicylic acid, ichthyol, mercury, borated alcohol, sulphur, zinc, and caustic potash. Acne rosacea is a chronic hyperæmic disease of the face, more especially of the nose, characterized by hypertrophy, redness, dilatation of the blood vessels and acne. In one form acne papules and pustules are plenty, and appear on a background of bright red infiltrated skin. In the other form of Acne rosacea there is a general erythema or redness, with enlargement of the superficial veins of the skin, and frequently a hypertrophy of the nose or chin. If extensive, and if the hypertrophy becomes excessive, the term Acne hypertrophica is applied to these cases. If the usual acne treatment fails, scarification or removal of the surface with the knife is necessary in Acne rosacea and Acne hypertrophica. In Acne atrophica, which usually occurs upon the temples and border of the scalp, wings of the nostrils and between the eyebrows, there is necrosis of the tissues with resulting contractions and pits. In Acne keloid there is a deep infiltration of the true skin with destruction or alteration of the hair. Its favorite seat is on the back of the neck. Cauterization is the treatment. Many cases of facial acne are cured or improved by the X-ray treatment.

ACOCK'BILL. See ANCHOR.

ACŒMETÆ, ăs'ē-mē'tē (Gk. ἀ, *a*, priv. + κοιμᾶσθαι, *koimasthai*, to sleep). A class of Greek monks called watchers, who chanted service continuously day and night, dividing, like sailors, into three watches. They originated about 400 A.D. on the Euphrates, later appeared in Constantinople, and established many monasteries, the chief one being the Studium in Constantinople itself, erected by the consul Studius in 471. They were excommunicated in 534 by Pope John II. for opposing the formula, "One of the Trinity suffered," and thus placing themselves on the Nestorian side.

ACOIN, ăk'ō-ĭn. A white crystalline substance, soluble in water, derived from guanin, and closely related to caffeine and theobromine. Chemically, it is di-para-anisyl-mono-phen-ethyl-guanidin-chlor-hydrate. Experiments have shown that it is less toxic than cocaine (q.v.), like which it is employed as a local anæsthetic in the eye. It has been used by dropping an aqueous solution upon the conjunctiva, causing more pain than cocaine, and also seeming less effective than cocaine in cases in which there was congestion. In other cases it has been found as rapidly efficient as cocaine, but producing no change in the pupil, accommodation or intraocular tension. After cocainizing the conjunctiva it may be injected without pain.

ACOLLAS, ȧ'kō'lȧ', ÉMILE (1826-91). A French jurist and publicist. He was born at La Châtre, and was educated at Bourges and Paris. He was one of the most conspicuous representatives at the Congress at Geneva in 1867, when the formation of a general European democratic confederation was advocated, and upon his return to France was condemned to one year's imprisonment for his active participation in the deliberations of that party. In 1871 the Paris Commune nominated him, during his absence in Switzerland, president of the legal faculty, and in 1880 he was appointed inspector-general of the penitentiaries. Among his numerous publications, all of which emphasize the principles "Droit et Liberté," the most important is *Cours élémentaire de droit*, a work consisting of seven volumes, published in the form of manuals.

ACOLYTES, ăk'ō-līts (Gk. ἀκόλουθος, *akolouthos*, a follower). A name occurring first about the third century, and applied to functionaries who assisted the bishops and priests in the performance of religious rites, lighting the candles, presenting the wine and water at the communion, etc. They were considered as in holy orders, and ranked next to sub-deacons. These services have since the seventh century been performed by laymen and boys, who are improperly called acolytes; but in the Roman Church aspirants to the priesthood are still at one stage consecrated as acolytes, and receive candles and cups as the symbols of the office. See ORDERS, HOLY.

ACOMA, ä'kō-mä. An Indian pueblo in Valencia County, New Mexico, about 70 miles west of Albuquerque (Map: New Mexico, E 2). Population, in 1900, 492; in 1902, estimated, 650. With Isleta it has the distinction of occupying its sixteenth-century site, and is the oldest continuously occupied town in the United States. It was visited (1540) by members of Coronado's expedition, by Espejo (1583), and Juan de Oñate (1598). Espejo named it Acoma; previously it was known as Acus, Acuco, and Coco. In December, 1598, Juan de Zaldivar, of Oñate's force, visited Acoma and, with half his party of 30, was killed by the natives. In the next month his brother Vicente killed half the Acoma population of 3000 and partly burned the pueblo. Franciscans labored here before 1629 and later established the San Estevan Mission. The Acomas successively occupied many village sites in prehistoric times, the last before Acoma being Katzimo, the enchanted mesa, three miles distant. Water in the Acoma mesa is obtained from natural cavities in the rocky summit (357 feet high). The Acoma reservation comprises 95,792 acres. Consult: H. H. Bancroft, *History of Arizona and New Mexico* (San Francisco, 1889); Lummis, *Land of Poco Tiempo* (New York, 1893); and Hodge, "The Enchanted Mesa," in *National Geographic Magazine*, vol. viii. (Washington, 1897).

ACONCAGUA, ä'kōn-kä'gwä; Span.-Amer. pron. kä'wä. An extinct volcano in the southern part of the Andes, situated in lat. 32° 39′ S., long. 70° W., on the boundary line between Chile and Argentina, and belonging to the latter (Map: Chile, C 10). It is usually considered the loftiest mountain in America, its estimated height being about 23,080 feet. A river of the same name rises on the southern slope of the mountain and enters the Pacific after a course of over 200 miles. Consult: E. Fitzgerald, "The First Ascent of Aconcagua," in *McClure's Magazine*, Volume XI. (New York, 1898); Sir M. Conway, "Aconcagua and the Volcanic Andes," *Harper's Magazine*, Volume C. (New York, 1899).

ACONCAGUA. A central province of Chile, bounded by the Chilean provinces of Coquimbo on the north, Santiago on the south and Valparaiso on the southwest, Argentina on the east, and the Pacific on the west (Map: Chile, C 10). It covers an area of 6226 square miles. The mountainous regions which occupy the larger part of the province are mostly barren, while the valleys of the Aconcagua River and other streams are highly fertile and produce different kinds of fruit, as well as hemp and some grain. The province also contains considerable deposits of copper. The population in 1895 was 113,165; Dec. 31, 1903, 132,670. Capital, San Felipe (q.v.).

AC'ONITE, ACONITUM (Lat. *aconitum*, Gk. ἀκόνιτον, *akoniton*, wolf's-bane). A genus of plants of the order Ranunculaceæ, having five irregular sepals, the upper one hooded and two spurred petals concealed under the hood. The roots are usually fusiform and clustered. The whole plant is very poisonous, containing a number of alkaloids, among which are aconine, aconitine, and isaconitine. Some of these are employed in medicine, being administered in small doses for nervous and other disorders. The Wolf's-bane or Monk's-hood (*Aconitum napellus*) is often cultivated for its racemes of handsome blue flowers. A number of species is said to be employed in India in the manufacture of the bikh poison. Aconitum album, with white flowers, and Aconitum lycoctonum, with yellow flowers, European species, are often met with in flower gardens. Aconitum uncinatum, which has blue flowers, and Aconitum reclinatum, with white flowers, are found in the eastern United States, while Aconitum columbianum is common from the Rocky Mountains to the Pacific. It is reputed poisonous to stock, especially to sheep. Consult: H. G. L. Reichenbach, *Monographia Generis Aconiti* (Leipzig, 1820); W. Weil, translated by H. D. Millard, *A Monograph upon Aconite* (New York, 1860); L. H. Bailey, *Cyclopædia of American Horticulture* (1900-1901). For illustration, see Plate of ACACIA.

ACONTIUS, ȧ-kŏn'shĭ-ŭs (Gk. 'Ακόντιος, *Akontios*). The hero of a classic love story contained in a lost poem of Callimachus, and also given by Ovid (*Heroides* xx. 21). He is a youth from Ceos, who, being at Delos and in love with Cydippe (q.v.), throws at her feet an apple on which he has written, "I swear by the sanctuary of Artemis to marry Acontius." Inadvertently she reads the words aloud, and in spite of her inclination to have nothing to do with the youth, is held by the goddess to her vow thus made. Consult: Morris, "The Story of Acontius and Cydippe," in *The Earthly Paradise*, part iii. (London, 1872).

ACORN, ā'kŭrn (properly, fruit of the field, A. S. *æcer*, a field). The nut-like fruit of different species of oak. It consists of the nut proper and the cupule, or saucer or cup. The acorns from different species differ much in size, form, color, and taste. In some the cup is deep and very rough; in others it is smooth and shallow. A few kinds of acorns are sweet and not unlike chestnuts in flavor, but most are bitter and more or less astringent in taste, owing to the presence of quercin, or some similar bitter principle, and tannin. On an average, fresh acorns have the following percentage composition: Water, 37.12; protein, 4.11; fat, 3.05; nitrogen free extract, 45.27; crude fibre, 8.95; and ash, 1.50. The shell makes up 14 per cent. of the total fruit, the flesh, 85 per cent. Acorns are a favorite food of wild hogs, and have been used since earliest times as feeding stuff for domestic animals, especially pigs. It is customary to let the pigs gather this food. Acorns and beechnuts are commonly spoken of as mast. The agreeable flavor of the pork, ham, and bacon of the razorback hog of the southern United States is attributed in no small degree to its being fed on acorns. On the other hand, an excess of acorns may produce a soft, spongy flesh and an oily lard. This, however, is usually obviated by feeding corn for two or three weeks before slaughtering. Acorns have been successfully fed to milch cows and to poultry. Horses also are said to eat them. In the United States acorns are not much eaten by men. Under the name "Biotes," the fruit of Quercus Emoryii is used as food in the southwest. Sweet acorns are eaten occasionally in different regions, mainly by children. The Indians of the Pacific coast region from northern California to Mexico use acorns in considerable quantities. Dried and pounded, they are made into a sort of mush, and also into bread. The acorn meal is usually leached to free it from tannin and whatever bitter principle is present. When the meal is used for bread a kind of clay is sometimes mixed with it. In several regions of Italy, notably Umbria, Tuscany, Emilia, and the Marches, acorns made into a sort of bread with the addition of two-thirds ground grain are a common article of diet. The bread is black and heavy and not readily digestible. Dried acorns are sometimes used as a substitute for coffee. See OAK.

ACORN-SHELL, ā'kŭrn-shĕl. A sessile barnacle of the family Balanidæ. See BARNACLE.

ACORUS (Gk. ἄκορος, *akoros*, sweet-flag). A genus of plants of the natural order Araceæ. (See ARUM.) The plants of this genus have a leaf-like scape, which bears upon its side a dense, cylindrical, greenish spike of flowers. Here belongs the Sweet-flag (*Acorus calamus*), which was brought to Europe from Asia in the fifteenth century, but has become naturalized in England, Germany, etc., growing in marshes and ditches. In North America it is found from Nova Scotia to Florida, and west through Minnesota and Iowa. Its root (rhizome) is perennial, divided into long joints about the thickness of the thumb, has a bitterish, acrid taste, and is very aromatic. It is a powerful medicine of transient tonic effect, occasionally used, especially in cases of weak digestion. In many places on the Continent of Europe it is found in confectionery shops sliced and prepared with sugar. It is also used to correct the empyreumatic odor of spirits and to give them a peculiar flavor. It is called Calamus root. In Great Britain it is chiefly employed by perfumers in the manufacture of hair powder. The other species of Acorus are likewise aromatic, and are applied to the same uses. Acorus gramineus is cultivated in China. Some fossil species of Acorus have been found in rocks of the Tertiary Age in North America and on the island of Spitzbergen, and in later formations in other parts of the world.

ACOSTA, ȧ-kŏs'tȧ, GABRIEL, later URIEL (1594?-1647). A Portuguese philosopher, descended from a Jewish family. He was born at Oporto. After being educated in the doctrines of the Roman Catholic Church, when twenty-five years of age he became skeptical, and then adopted the Jewish faith; but as the profession of such was not allowed him in his own country, he fled to Amsterdam, where he was formally received into the Jewish community, and changed his name, which had been Gabriel, to Uriel. But what he conceived to be the Pharisaism and spiritual pride of the Amsterdam Jews disgusted him, and he opposed many of their ideas, and especially denied that the doctrine of immortality had any Mosaic sanction. Hence he became involved in a controversy with his rabbinical teachers. On account of his work, entitled *Examen dos tradiçoens Phariseas conferidas con a ley escrita* ("Examination of Pharisaic Traditions Compared with the Scripture"), 1624, he was charged with atheism by the Jews before the city magistracy and fined. He was also excommunicated, and so remained for seven years, when he recanted after ignominious treatment. He died in 1647 by suicide. His autobiography was first published by P. Limborch in Latin, 1687; English translation, London, 1740; Latin and German edition, H. Jellinek, Leipzig, 1847. He is the hero of an effective tragedy by Gutzkow.

ACOSTA, Joaquin (?-1852). A South American geographer. He was born at Guaduas, Colombia. In 1834 he made a tour with the botanist Céspedes through the valley of the Socorro as far as the Magdalena, and seven years afterward traveled from Antioquia to Anserma for the purpose of studying the history and customs of the native tribes. Besides an excellent map of New Granada, Acosta published the following interesting and valuable works: *Compendio histórico del descubrimiento y colonización de la Nueva Granada en el siglo décimo sexto* (Paris, 1848); *Semenario de la Nueva Granada, Miscellánea de ciencias, literatura, artes e industria,* with portraits and map, published in conjunction with Laserre under the direction of Francisco José de Caldas (Paris, 1849).

ACOSTA, José de. (1539-1600). A Spanish Jesuit. He was born at Medina del Campo, Spain. He entered the Society of Jesus and went as missionary to Peru, where he labored for many years. Upon his return home he became superior of the Jesuit Seminary of Valladolid, and afterward rector of the University of Salamanca, where he died. His fame rests upon his work on the natural history of the New World and the efforts put forth for its evangelization, published in Latin at Salamanca in 1589, and in Spanish (Seville, 1590). The last-named publication was under the caption *Historia natural y moral de las Indias,* and was several times reprinted and translated into French, Dutch, and English (*The Naturale and Morale Historie of the East and West Indies,* London, 1604).

ACOUCHY, ȧ-kōō′shė, or **ACUCHI.** See Agouti.

ACOUMETER, ȧ-kou′mė-tẽr *or* ȧ-kōō′-, or **AC′OUSIM′ETER** (Gk. *ἀκούειν, akouein,* to hear + *μέτρον, metron,* measure). An instrument used to determine the acuteness of hearing. It is a small steel bar which, when struck by a hammer, gives a uniform sound.

ACOUSTICS, ȧ-kou′stĭks *or* ȧ-kōō′- (Gk. *ἀκουστικός, akoustikos,* relating to hearing, from *ἀκούειν, akouein,* to hear). The name applied to the science of the phenomena of sound. The name "sound" is given to the sensation perceived by the auditory nerves, and it is a matter of everyday experience that the immediate cause of the sensation is some vibrating body, e.g., a violin string, a drum head, a hammer when striking a nail. This was early recognized, and, so far as acoustics is considered as a science dealing with the vibrations of matter and with the waves produced in the air by this motion, the history of its development is identical with the progress of mathematics and dynamics from the time of Galileo and Newton to the present. Few dates can be assigned to definite discoveries. The laws of vibrations of a stretched string were first deduced mathematically by Brook Taylor in 1715 and by Daniel Bernoulli in 1755, although they had been discovered experimentally by Mersenne in 1636. Longitudinal and torsional vibrations of bars were first investigated by Chladni (1756-1827). Daniel Bernoulli was the first to attack the problem of the lateral vibrations of bars; but the mathematical treatment of the question is still of interest. Poisson (1829) was the first to give a correct mathematical solution of the free vibrations of a membrane, and good experimental work on the subject has been done by Savart, Bourget, and Elsas. The vibrations of plates have been studied mathematically by Poisson, Kirchhoff, and more recent writers, and experimentally by Chladni, Savart, and Wheatstone. A full account of the history of the mathematical side of acoustics will be found in Rayleigh's great work on the *Theory of Sound.*

The history of that portion of acoustics which considers the phenomena of the sense of hearing, harmony, discord, pitch, etc., begins undoubtedly with the earliest days of civilization. It was known to Pythagoras (sixth century B.C.)—and to whom before him no one can tell—that sounds were in harmony when produced by two stretched strings of the same material, cross-section and tension, provided their lengths were in the ratio of 1 : 2, 2 : 3, or 3 : 4. Mersenne discovered in 1636 that the frequencies of such vibrating strings varied inversely as their lengths, and so proved that for two notes to be in harmony it was necessary for their frequencies to bear simple numerical relations to each other. No explanation of this fact was given until the great research of Helmholtz, begun in 1854, the results of which were published in 1862 in his classical work on the *Sensations of Tone.* Helmholtz was the first to discover the existence of summational tones, although the differential tones were discovered probably by Romieu in 1743, and certainly by Sorge, the court organist at Lobenstein, in 1745. Helmholtz's theory of vowel sounds is still under discussion. Most interesting work on audition has been done in recent years by Rudolf König of Paris and Professor Mayer of Hoboken.

Many of the physical properties of sound are matters of common experience and can readily be appreciated. In the first place, it is well known that an interval of time elapses between the vibration of the body and the perception of the resulting sound if the vibrating body is at a considerable distance; thus the flash of a gun is seen before the sound is heard. It was shown by Otto von Guericke that if a bell is set ringing in a glass jar from which the air has been exhausted no sound is heard; so that the presence of some material medium between the vibrating body and the ear is essential for the production of sound. This medium need not be air, but may be water, or, in fact, any gas, liquid, or solid which can carry waves. The whole mechanism is, then, as follows: The vibrations of the body, e.g., a drum-head, produce waves in the medium in contact with it, e.g., the air; these waves spread out through the medium and, after a certain interval of time, reach the ear; in the ear the waves produce motions of the ear-drum and corresponding effects in the internal ear where the auditory nerves have their endings. It should be noted that not every vibration will produce waves in a fluid medium; because if the number of vibrations per second is too small, the fluid will simply flow around the body as it vibrates, and so will not be compressed; consequently, in order to produce waves in a fluid, the frequency of the vibrations of the body must exceed a certain number, which depends upon the viscosity and density of the fluid. Further, it is evident that, since fluids can carry only compressional (i.e., longitudinal) waves, the production of the sound-sensation is due to waves of this kind. The difference between the longitudinal and the transverse wave can be appreciated by reference to the accompanying diagram, Fig. 1.

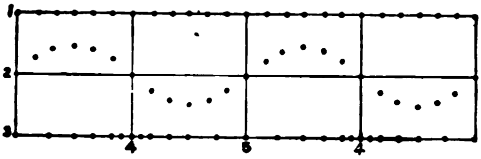


FIG. 1.

In this illustration 1 represents a row of particles at rest; these particles displaced to form a simple transverse wave are shown in 2, while a longitudinal wave is shown in 3. Here each particle moves to and fro in the direction of the line of propagation of the wave, and the amplitude of the wave is the distance that each particle moves from its position of rest, while the wave-length is the distance between similar points of condensation and rarefaction, as from 4 to 4. Although sound is produced by longitudinal waves, there is no reason for believing that all compressional waves will produce sounds; some may be too long or too short to affect the nerves of the ear.

Our sense of hearing distinguishes between two great classes of sounds: noises and musical notes. A noise is recognized as being abrupt, discontinuous, and exceedingly complex; a musical note is smooth, continuous, and with a definite, regular character. We distinguish, further, between different musical notes as being simple or complex, meaning, by the latter, a note in which we can recognize the presence of several simple tones. Thus, if a piece of paper is torn, or two blocks of wood struck together, we call the resulting sound a noise. The vibrations of a tuning-fork cause a simple musical note; while if a banjo string is plucked we hear a complex note. Complex notes differ greatly in their character. They are said to have "quality" or "timbre;" thus, a sound produced by an organ-pipe has a quality entirely different from one produced by a piano or by a drum. Simple notes may differ in loudness and in shrillness or "pitch;" thus, a note of a definite pitch may be loud or feeble, and the pitch of a piccolo note is quite different from that of a note produced by a flute.

WAVES AND VIBRATIONS. Since the direct cause of a sound is the reception into the ear of waves in the air, it is necessary to analyze the nature of these waves. We may have an irregular, isolated disturbance, which is analogous to a "hump" passing along a stretched rope, or to the effect of dropping several stones at random intervals into a pool of water; or we may have a regular continuous succession of waves identical in all respects, which is called a "train of waves." The simplest kind of train of waves is what is called a "simple harmonic" train, such as is produced in any medium by a simple harmonic vibration of the body which is causing the waves. (Vibrations of a pendulum are simple harmonic.) Such a train of waves is characterized by its "wave-number" and "amplitude;" the wave-number being the number of individual waves which pass a given fixed point in one second, while the amplitude is the extent of the path of vibration of any particle of the medium through which the waves are passing. The velocity of waves of a definite character, e.g., compressional ones, in any definite homogeneous medium depends upon the properties of the medium itself, not on the wave-number or amplitude of the waves. So, if λ is the wave-length, i.e., the distance from one point in the medium to the next point, measured in the direction of advance of the waves, where the conditions are identical with those at the first point, and if N is the wave-number, the velocity of the waves V is given by the formula

$$V = N\lambda$$

Consequently, if N is known, λ can be calculated, and *vice versâ;* and the characteristics of the simple harmonic train of waves may be said to be its wave-length and its amplitude. If several trains of waves are passing through the same medium at the same time, the resulting waves—called a "complex" train—is simply the sum of the individual waves, the motion of any particle of the medium being the geometrical sum of the motions which it would have, owing to each of the separate trains of waves. (This is rigidly true only if the amplitudes of these separate trains are very small compared with their wave-lengths, as in general they are.)

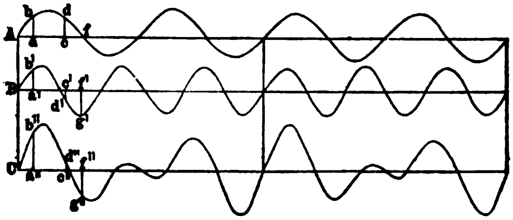


FIG. 2.

This is shown in Fig. 2, where A and B are two sets of simple harmonic waves which form the resultant wave C. This wave is obtained by taking the algebraic sum of the motion of the particles. The point b'' is obtained by taking $a''b''$, equal to the sum of $a\,b$ and $a'b'$, $c''\,d''$ is the sum of $c\,d$ and $c'd'$, the latter, as it occurs below the axis, considered as having a negative sign. Conversely, it may be shown that any complex train of waves may be analyzed into simple harmonic trains. Therefore, complex trains of waves may differ in several ways: 1. The number of the component simple harmonic trains. 2. Their wave-numbers and amplitudes. 3. Their relative "phases," for two waves are in different phase if the maximum displacement due to one train does not coincide in position with that due to the other; or, looked at in another way, the component trains may have been started at irregular intervals. Since waves are due to the vibrations of some elastic body (e.g., a tuning-fork, the air in an organ-pipe or horn), it is necessary next to analyze the nature of vibrations. We may have an irregular vibration, consisting of only a few to and fro motions, then a sudden change into another vibration of a different character, the whole motion lasting only a short time, e.g., when a piece of stiff paper is torn or when a scratching pen is used in writing; or we may have a regular continuous periodic vibration. The simplest possible periodic vibration is like that of a simple pendulum, and it is called "simple harmonic." It is characterized by a definite number of vibrations per second, i.e., its "frequency," and by the extent of the swing, i.e., its "amplitude." If a second pendulum is suspended from the bob of the first, and a third from the bob of the second, the vibration of the third and lowest bob is no longer simple harmonic in general. Its vibration is called "complex;" and it is evident that it is the sum of the vibrations of the separate pendulums. Complex vibrations may, therefore, differ in the number of the component vibrations, and in their frequencies, amplitudes, and relative phases.

SOUND SENSATION. It would be expected that there should be some connection between the nature of the vibrations of the vibrating body, that of the waves produced, and that of the sound heard. Such is the case. A noise is always produced by an irregular, disconnected disturbance in the air; and this in turn is due to an irregular succession of vibrations, each lasting for a brief interval. A simple musical note is always due to a simple harmonic train of waves, and this to a simple harmonic vibration. The loudness of the note varies directly with the amplitude of the waves; whatever increases the amplitude of the waves increases the loudness of the sound, and *vice versâ*. It is increased, therefore, by an increased amplitude of the vibration; and it decreases as the distance from the ear to the vibrating body is increased. (It should not be thought, however, that numerical values can be given the loudness of a sound, or that there is any fixed numerical relation between the amplitude of the waves and the intensity of the sensation.) The pitch of the note depends upon the wave-number of the waves entering the ear; whatever increases the wave-number "raises" the pitch, and *vice versâ*. Therefore, if the ear and the vibrating body are at a fixed distance apart, and at rest with reference to their positions in space, the pitch will vary directly with the frequency of the vibrating body; thus we often use the expression, "a pitch of 300," meaning the pitch of a sound produced by a vibrating body which makes 300 complete vibrations in one second. If, however, the vibrating body is approaching the ear, or if the ear is approaching the vibrating body, the number of waves entering the ear is greater than it would be if there were no such motion; and so the wave-number is greater than the frequency of the vibrating body, and the pitch of the sound is raised. Similarly, if the distance between the ear and the vibrating body is increasing, the wave-number is less than the frequency of the vibration, and the pitch is lowered. This change of pitch, due to the relative motions of the ear and the vibrating body in the surrounding medium, is known as Doppler's Principle (q.v.), and is illustrated by the sudden drop in pitch if one stands on the platform of a railway station and listens to the whistle of a locomotive passing at a high speed.

A complex musical note is always due to a complex train of waves, and this, in turn, to a complex vibration, if there is only one vibrating body. Further, two notes which differ in quality may be shown to be due to complex trains of waves which differ in complexity. But it should be noted that all experimental evidence points to the idea that differences in relative phases of the component trains of waves do not cause differences in the quality of the sound heard. In other words, two complex trains of waves made up of the same simple waves will produce the same sound, regardless of the phases in the two trains. This may be explained by saying that the ear automatically resolves a complex train of waves into its simple harmonic component trains, hears the simple tones due to each of these, and, therefore, has a complex sensation. This statement is called "Ohm's law for sound-sensation."

FUNDAMENTAL, PARTIAL, AND COMBINATIONAL VIBRATIONS. Musical instruments may be divided roughly into two classes, wind and string instruments. In the former class are included organ-pipes, horns, flutes, etc.; in the latter, pianos, violins, harps, etc. In all wind instruments a column of air inclosed in a metal or wooden tube is set in vibration by suitable means, and this vibrating mass produces the waves in the surrounding air. In string instruments, flexible strings are stretched between pegs fastened to a solid frame—in general a wooden board—and they are set in transverse vibration by bowing, plucking, or striking. As a result of the vibration of the string, the frame holding the pegs is itself set in vibrations of the same frequency, and it, as well as the string itself, produces the waves. The importance of the so-called sounding-board is at once evident.

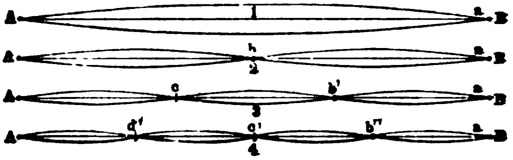


Fig. 3.

A stretched flexible string, *A B*, can vibrate in many waves: as a whole, with its middle point its point of greatest amplitude, as in 1 (fig. 3); in two parts, with its middle point, *b*, at rest, and the two halves vibrating like separate strings in opposite phases, as in 2 (fig. 3); in three parts, with two points, *c* and *b*, at rest, dividing the string into three equal vibrating segments, as in 3 (fig. 3), etc. The frequencies of these different modes of vibration are in the ratios of 1 : 2 : 3 : 4, etc. The vibration of the string as a whole is called the "fundamental;" the others, the "upper partials." The frequency of the transverse vibrations of a stretched flexible string is given by the formula

$$N=\frac{1}{2L}\sqrt{\frac{T}{m}}$$

where T is the stretching force or tension, m is the mass of each unit length of the string, L is the length of the vibrating segment. Thus, in the fundamental, L is the length of the string; in the first upper partial it is one-half the length of the string, etc. When the string is set vibrating by a random blow or bowing, it will make complex vibrations, resulting from the combination of the fundamental and some of the upper partials, the number and relative intensities of these depending largely on the point where the blow is struck, or the bow applied, and on the character of the impulse. So, whenever a musical tone is produced by a string instrument, the ear can recognize in the complex sound simple tones due to the fundamental and the upper partials; and differences in the quality of sounds caused by different string instruments, which have fundamentals of the same frequency, are due to differences in the number and character of the upper partials, which depend in turn on the material of the string, the point where the impulse is applied to set the string in motion, and the character of this impulse. Similarly, the vibrating column of air in organ-pipes, horns, etc., can vibrate in different ways; and in a complex vibration there is a fundamental and upper partials whose frequencies are in the ratios of 1 : 2 : 3 : 4, etc. The frequency of the vibrations of the fundamental in an open organ-pipe is given by the formula:

$$N=\frac{V}{2\ L}$$

where V is the velocity of waves in the gas which fills the pipe, and L is the length of the pipe approximately. The similar formula for a "stopped" pipe is:

$$N=\frac{V}{4\ L}$$

(In stopped organ-pipes the vibrations are in the ratios 1 : 3 : 5 : 7, etc.) In other instruments than wind and string ones, such as drums, cymbals, etc., there are upper partials besides the fundamental; but there is no simple mathematical relation between their frequencies. When two organ-pipes on the same wind-chest are "sounded" loudly, the resulting waves in the air are not due simply to each fundamental and its upper partials, but also to certain extra vibrations due to the combined action of the two vibrating columns of air on the surrounding air. Thus, if the fundamentals of the two pipes have frequencies 1000 and 600, there will be present waves showing the existence of vibrations whose frequencies are 1000 + 600 and 1000 − 600. The sounds heard owing to these vibrations are called "summational" and "differential" tones, or, in general, "combinational" tones; they are always difficult to hear. The existence of both partial and combinational vibrations may, however, be established by means of resonators (q.v.).

HARMONY AND DISCORD. If two organ-pipes whose frequencies do not differ much are sounded together, the ear observes a fluctuation in the loudness of the resulting sound. It is first loud, then weak, loud and weak, etc., giving rise to what are called "beats," the number of beats per second being equal to the difference in the frequencies of the pipes. Thus, two pipes of frequencies 280 and 285 produce 5 beats per second. The explanation of the phenomenon lies in the superposition of the two resulting trains of waves; for, if the wave-number of one train exceeds that of the other by five, it will happen five times in the course of a second that when one train of waves reaches the ear in a certain phase, the other train will reach the ear in an exactly opposite phase; and so the two waves will tend to neutralize each other's action and thus make the sound weak; whereas, in between these instants of weakness there will be others when the two waves reach the ear in the same phase, and so reinforce each other and thus make the sound loud. This is shown diagrammatically in fig. 4, where there are two trains of waves of unequal wave-number which interfere and produce beats. The wave-length of one set is $A\ d$, which is four-fifths of $A\ l$, the wave length of the other. The two waves at A are in the same phase, and there is increased sound; but as the motion progresses, one train loses with respect to the other, until they are in opposite phase, as at C and D, where silence ensues. Beats are disagreeable to hear, for the same reason that a flashing light is unpleasant to see, or a tickling feather to feel, namely, the nerves being first stimulated, then allowed to partially recover, then again stimulated, etc., are disagreeably affected. The degree of unpleasantness depends in part on the number of beats, but also on the pitch of the note, whose intensity is fluctuating. Beats can be formed by the interference of the upper partials as well as by the fundamentals, and by the combinational vibrations also. Thus, if two organ-pipes of frequencies 500 and 252 are sounded together, the first upper partial of the pipe whose fundamental is 252, i.e., a note of frequency 504, will beat with the other fundamental whose frequency is 500. If, however, two organ-pipes are sounded whose fundamentals are such that there are no beats except between the upper partials of high orders, the sensation should be a pleasant one; and such is observed. To secure such a condition it is evident that the ratios of the frequencies of the fundamentals must be simple fractions, 1 : 1, 1 : 2, 1 : 3, 2 : 3, 1 : 4, 3 : 4, etc. Such combinations of two notes produce what is called "harmony." On the other hand, whenever beats can be expected between two notes or their partials, or their combinational notes, an unpleasant sensation called "discord" is observed, it being possible to predict the degree of the discord from the number of beats which most occur. This explanation of harmony and discord is due to Helmholtz. The explanation of "melody," that is, the pleasant sensation perceived when notes, suitably chosen, are sounded consecutively, is undoubtedly psychological, not physical. For the discussion of the formation of musical scales based on these simple harmonies, see MAJOR; MINOR.

LIMITS OF HEARING. Aërial waves of all wave-numbers do not affect the auditory nerves of the normal human ear, it being found by trial that wave-numbers less than 30 do not produce a musical tone, and wave-numbers exceeding about 20,000 do not produce sound at all. For musical purposes the extremes are about 40 and 4000. To study waves whose wave-numbers exceed 10,000 (and in fact for those of much less num-

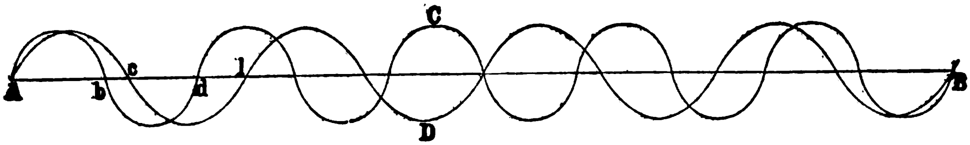


FIG. 4.

ber) the best instrument is the "sensitive flame," which consists ordinarily of an ignited jet of gas escaping from a small circular orifice under high pressure, thus giving a more or less cylindrical flame about a foot high. When waves of a great wave-number fall upon such a flame they break through the inclosing envelope separating the gas from the air, thus causing the jet to "flare" out like a fan.

Velocity of Sound. The waves produced in the air by vibrating bodies are often called "sound waves," although the name is not a good one. Similarly, compressional waves in any medium, solid, liquid, or gas, are called "sound waves" in these media. These waves spread out from the vibrating body into the surrounding medium with a velocity called the "velocity of sound," which depends alone upon the elasticity of the medium with respect to a compression and upon its density, if the medium is homogeneous. Like all waves, they may experience reflection, e.g., echoes; refraction, as when passing from cold air to hot air, or dense air to rare; dispersion; interference. Reference should be made to a paper by Professor R. W. Wood in the *Philosophical Magazine,* Volume XLVIII., p. 218, 1899, for a description of a most interesting series of experiments on these properties of aërial waves. The best determinations of the velocity of these waves are given in the following table:

Gases at 0° C.		
Air (dry)	331.36	meters per second
Hydrogen	1286.	" " "
Oxygen	317.	" " "
Carbon dioxide	262.	" " "
Solids and Liquids.		
Aluminium	5104.	" " "
Steel	4990.	" " "
Glass, about	5500.	" " "
Water	1435.	" " "

The velocity of compressional waves varies greatly with the temperature. For a gas the velocity at t° C. equals that at 0° C. multiplied by

$$\sqrt{\frac{273+t}{273}}$$

When waves pass from a region where the air is cold into one where it is warm, reflection takes place at the bounding surface, and thus the entering waves are not only refracted but also weakened in intensity. The presence of fog by itself in the air has very little effect upon the waves, unless there are currents or layers of hot or cold air. The velocity of waves in air is practically independent of the intensity of the vibration, although the waves produced by a sudden explosion travel at first slightly faster than do ordinary waves.

Acoustic Properties of Halls. When an organ-pipe or any elastic body is sounded in a room and then suddenly stopped, it is noticed that the sound does not instantly cease, but continues for several seconds. This is called reverberation; and the acoustic success of a room depends largely upon its duration. It should not exceed two seconds by more than a few tenths of a second if the room is to be used as a music hall or opera house. It is found that the reverberation in a given room is practically independent of the place where the vibrating body is situated, or of the position of the hearer; it depends upon the volume of the room, upon the material of the walls and floors, upon the cushions, the audience, etc., and to a certain extent upon the intensity of the sound. The following approximate formula has been developed by Professor Sabine of Harvard University:

$$(a + b_1 x_1 + b_2 x_2 + \text{etc.})\ t = 0.164\ V$$

Where a is a constant depending upon the absorbing power of the walls of the room.
b is a coefficient of "absorption" for one square meter of a definite material put anywhere in the room, the standard of comparison being the absorption of one square meter of open window.
x is the number of square meters of the material.
t is the duration of reverberation.
V is the volume of the room in cubic meters.

The absorption coefficients for some substances are as follows:

Hard pine wood sheathing	0.061
Plaster on wood lath	0.034
Plaster on wire lath	0.033
Audience (per square meter)	0.96
Isolated woman	0.54
Isolated man	0.48
Carpet rugs	0.20
House plants	0.11
Upholstered chairs	0.30
Hair cushions (per seat)	0.21

The duration of reverberation in certain music halls and auditoriums is as follows:

Old Music Hall, Boston, Mass	2.44
New Music Hall, Boston, Mass	2.31
Gewandhaus, Leipzig, Germany	2.30
Sanders' Theatre, Cambridge, Mass	3.42

Bibliography. Rayleigh, *Theory of Sound,* 2 volumes (London, 1896), a mathematical treatment, but with several descriptive chapters; Helmholtz, *Sensations of Tone,* translated by Ellis (London, 1895), the standard authority on harmony and music; Sabine, *Architectural Acoustics* (Boston, 1900), which contains the only satisfactory treatment of this important question; Thomson and Poynting, *Sound* (London, 1900), a text-book for schools and colleges, and a storehouse of accurate information.

ACQUI, ä′kwē (ancient *Aquæ Statiellæ*). An episcopal city of northern Italy, on the left bank of the Bormida, 37 miles northwest of Genoa (Map: Italy, C 3). Every winter more than 6000 persons take the cure at the hot and cold sulphur springs that gave it its name. It has a Gothic cathedral of the eleventh century, a seminary, a college, and the ruins of a Roman aqueduct. The chief trade is in silk, lace, rope, and wine. Pop., 1901, 13,786.

AC′QUISI′TION. In law, a term which has the double meaning of the acquirement of territory by the state, and of title to real or personal property by the individual. In the case of the state it is effected in three ways: (1) By occupation, (2) by treaty and convention, and (3) by conquest (q.v.). As referring to the origin of title to lands or goods, acquisition is either original or derivative. The former comprehends occupation, accession, and prescription or limitation; the latter, the more usual modes of acquiring title, as alienation by gift or sale, exchange, inheritance, and transfer by will (qq.v.). In the English and American law of real property the whole subject is dealt with under the head of title (q.v.). Consult: Blackstone, *Commentaries on the Laws of England;* Kent, *Commentaries on American Law.*

ACQUIT'TAL (O. F. *aquiter*, from Lat. *ad*, to + *quietare*, to quiet). In criminal law, the judicial discharge of the accused. It may result from some technical defect in the proceedings, or from a verdict in the accused's favor on the merits. In the former case, it is not a bar to a second prosecution for the same offense; in the latter case, it is a bar, as well by common law as, in this country, by constitutional provision. See AUTREFOIS ACQUIT and JEOPARDY.

ACRA'NIA (Gk. *ἀ*, *a*, priv. + *κρανίον*, *kranion*, skull). A group of vertebrates having no skull or heart, and represented only by the lancelets. See AMPHIOXUS.

ACRA'SIA (Gk. *ἀκρασία*, *akrasia*, intemperance). A beautiful enchantress in Spenser's *Faerie Queen.* Her name denotes her character. She dwells in a "Bower of Bliss," on a floating island of sensuous delight, and the fairy queen sends Sir Guyon to make an end of her seductive abode.

ACRA'TES (Gk. *ἀκρατής*, *akratēs*, intemperate). A male character in Spenser's *Faerie Queen*, typifying intemperance in the pursuit of pleasure.

A'CRE. A word identical with Lat. *ager*, Gk. *ἀγρός*, *agros*, a field, and the Ger. *Acker*, which means both a field and a measure of land. Most nations have some measure nearly corresponding; originally, perhaps, the quantity which one could plow in a day; uniformity, therefore, is not to be looked for.

The English statute acre consists of 4840 square yards. The chain with which land is measured is 22 yards long, and a square chain will contain 22 × 22, or 484 yards; so that 10 square chains make an acre. The acre is divided into 4 roods, a rood into 4 perches, and a perch contains 30¼ square yards. The Scotch acre is larger than the English, and the Irish than the Scotch. One hundred and twenty-one Irish acres = 196 English nearly; 48 Scotch acres = 61 English. The following table shows the values of the more important corresponding measures compared with the English acre. The German *Morgen* below are becoming obsolete. The German Empire, Austria-Hungary, Spain, and Portugal have adopted the French metrical system.

English acre	1.00
Scotch "	1.27
Irish "	1.62
Austria, joch	1.42
Baden, morgen	0.89
Belgium, hectare (French)	2.47
Denmark, tõnde land	5.05
France, hectare (=100 ares)	2.47
France, arpent (common)	0.99
Holland, "	2.10
Naples, moggia	0.83
Portugal, geira	1.43
Prussia, little morgen	0.63
Prussia, great morgen	1.40
Russia, desyatina	2.70
Saxony, morgen	1.36
Spain, fanegada	1.06
Sweden, tunne land	1.13
Switzerland, faux	1.62
" Geneva, arpent	1.27
Tuscany, saccata	1.22
United States, English acre	1.00
Württemberg, morgen	2.40
Roman jugerum (ancient)	0.66
Greek plethron (ancient)	0.23

ACRE, ä'ker *or* ā'ker, or ST. JEAN D'ACRE. A seaport on the coast of Syria, a few miles north of Mount Carmel. It has about 11,000 inhabitants. The harbor is partly choked with sand, yet is one of the best on this coast. Acre is the Accho of the Bible, and has been known at different periods as *Acco*, *Akka*, *Acon*, *Accaron*, and in Roman times *Ptolemaïs.* It is first mentioned in a dispatch sent by King Burraburiash of Babylon to Amenhotep IV. (1400 B.C.?). It was taken by the Assyrians under Sennacherib and given by Esarhaddon to the King of Tyre, with which it came subsequently into the possession of the Seleucid kings of Syria. The Romans made it a colony. In 638 the town was captured by the Arabs. In 1104 it was taken by the Crusaders; in 1187 it was recaptured by the sultan Saladin, and in 1191 fell once more into the hands of the Crusaders, and became the seat of a bishop and of the Order of St. John. It was the last stronghold of the Crusaders in Palestine, being surrendered to the Saracens in 1291, after an obstinate defense by the crusading orders. In 1517 it was captured by the Turks. In 1799 it was besieged by the French under Napoleon Bonaparte for sixty-one days, but was successfully defended by the garrison, aided by a body of English sailors and marines under Sir Sidney Smith. In 1832 it was stormed by Ibrahim Pasha, son of the viceroy of Egypt, and continued in his possession till it was bombarded and taken in 1840 by a combined English, Austrian, and Turkish fleet. See EGYPT; SELEUCIDÆ.

ACRE, ä'krā. A territory of Brazil, formerly belonging to Bolivia. See BOLIVIA and BRAZIL.

A'CRES, BOB. A character in Sheridan's *Rivals.* He appears as a somewhat rustic gentleman, of bombastic manners and ludicrous cowardice, noted particularly for what he calls his "oath referential or sentimental swearing."

ACRI, ä'krē. A city in Calabria, southern Italy, 13 miles northeast of Cosenza (Map: Italy, L 8). The neighboring country is beautiful, healthful, and fertile, and produces oil, wine, fruit, and cotton. Pop., 1901, 13,132.

ACRID'IDÆ. See GRASSHOPPER.

AC'ROBAT (Gk. one walking on tiptoe, from *ἄκρος*, *akros*, highest, + *βαίνειν*, *bainein*, to go). Originally it was doubtless used to denote the acrobatic feats of the rope-dancers, but in the course of centuries its meaning has extended so that it includes many things which were unknown to the Greeks and Romans as familiarly as were the rope-dancers, who, as Terence in his prologue to *Hecyra* complains, distracted the attention of the public from his play; and so does history repeat itself, a writer in the *Tatler* expresses his surprise at finding so small an audience at the opera, because the rope-dancer was not in the bill that night. The most recent celebrated exponent of the original art was Blondin, who crossed Niagara Falls on a rope, carrying a man on his back. But this was no unheard-of feat, for when Isabel of Bavaria, Queen to Charles VI. of France, made her entry into Paris, says Froissart, who was an eye witness, a cord was stretched from the highest house on the bridge of St. Michel to the topmost gallery of the Church of Our Lady and an acrobat carried two boys holding lighted candles over it. From being a rope-dancer, or rather balancer only, the acrobat gradually added to his exhibits other balancing and tumbling acts. Vaulting and juggling and contortions became part of the entertainments of the Middle Ages. Edward III. paid jugglers handsomely for exhibiting their acrobatic skill and the flexibility of their bodies. The austere Queen Mary even relaxed at their pranks; and when Queen Elizabeth attended the revels at Kenilworth Castle, which Sir Walter Scott has immortalized, she was vastly entertained by acrobatic tumblers. Even the wonderful balancing feats of the Japanese with ladders at right angles, up and down which a second man climbs in apparent defiance of the laws of equilibrium, had their prototypes, if not equals, among the European acrobats of two hundred years ago, while modern somersault-throwing and leaping through hoops are illustrated in manuscripts as far back as the fourteenth century. The more liberal interpretation of the word now includes performances on the trapeze, the horizontal bar, and the other pieces of apparatus usually found in gymnasiums for the development of the suppleness of the body. Consult: Le Roux and Garnier, *Acrobats and Mountebanks*, translated by A. P. Morton, illustrated (London, 1890).

AC′ROCERAU′NIA (literally, "Thunder-Heights," from Gk. *ἀκρος*, *akros*, highest, + *κεραυνός*, *keraunos*, thunderbolt). The northwestern promontory of Epirus, which forms the termination of the Ceraunian, or Acroceraunian, Mountains. It was a dangerous point for sailors, and was named from the frequent thunderstorms that occurred there. It is the modern Cape Glossa.

AC′ROCORIN′THUS (Gk. Ἀκροκόρινθος, *Akrokorinthos*). A steep hill 2000 feet in height which was the citadel of ancient Corinth, and is still crowned by ruined Byzantine fortifications. The hill commands a superb view.

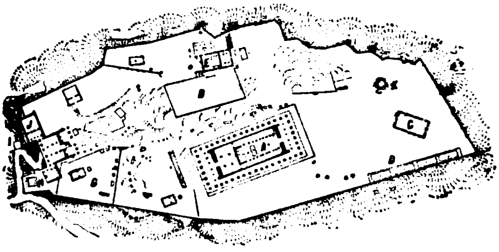
ACROLEIN, ȧ-krō′lē-ĭn (Lat. *acer*, sharp + *olere*, to smell), C_2H_3CHO. A colorless liquid having an extremely irritating odor. It is produced in the incomplete combustion of fats and when ordinary glycerin is distilled with sulphuric acid or other dehydrating agents. Some acrolein is produced when fats are overheated in cooking, and when the wick of a candle just blown out is left smoldering. Its reactions show that it contains the atomic group CHO; it is, therefore, classed with the aldehydes. Bromine adds itself directly to acrolein, forming an "additive product" of the composition, $C_2H_3Br_2CHO$; which shows that acrolein must be classed with the *unsaturated* organic compounds.

AC′ROLITHS (Gk. *ἀκρος*, *akros*, highest, extreme + *λίθος*, *lithos*, stone). In the early development of Greek art there came a period when the ideal of the Hellenes no longer permitted them to look upon a god as a mere idol, but as a being endowed with mind and consciousness. Therefore, instead of a tawdry representation, they conceived a worthier image carved in wood. The body was ornamented with a thin armor of gold; the head and lower extremities were formed of stone or marble. The figures so constructed were called acroliths.

AC′ROMEG′ALY (Gk. *ἀκρος*, *akros*, highest, extreme + *μέγας*, *megas*, great). A chronic nervous disease characterized by a gradual and permanent enlargement of the head, thorax, hands, and feet, and by a curvature backward of the spine. It was first described in 1886 by Marie. It occurs in both men and women, beginning apparently about the age of eighteen or twenty. Some pains and functional disturbances, as well as anæmia, accompany its onset. Both soft tissues and bones are enlarged, the lower jaw, tongue, lips, and nose being very greatly hypertrophied. The hand sometimes reaches 8 inches in length, the foot 12 inches, while the circumference of the head may reach 26 inches. The cause of this perversion of nutrition is unknown. Consult: Dana, *Text-book of Nervous Diseases* (New York, 1901).

A′CRON (Gk. Ἄκρων, *Akrōn*). A physician of the fifth century B.C., native of Agrigentum in Sicily. Tradition says that he successfully combated the great plague in Athens in 430 B.C. by building large fires to purify the air. The Empiricists claimed him as the father of their school. His medical works are wholly lost.

ACROP′OLIS (Gk. *ἀκρος*, *akros*, highest + *πόλις*, *polis*, city). Originally the fortified refuge of a district, usually containing the palace of the chief. For this purpose a natural stronghold was selected and strengthened by artificial defenses. Around the acropolis a city frequently arose, and when this was defended by a wall the acropolis sometimes lost its military character and was given over to temples, as having been the centre of the oldest cults. The acropolis of Athens is the best example of this change, and is also the most celebrated. (See ATHENS.) Other noteworthy acropolises are the Larissa at Argos, Acrocorinthus at Corinth, Mount Ithome at Messene, and the Cadmea at Thebes. The name is frequently applied to any fortified hill commanding an ancient site; so at Troy, Mycenæ, Tiryns, Pergamum, Priene, etc.



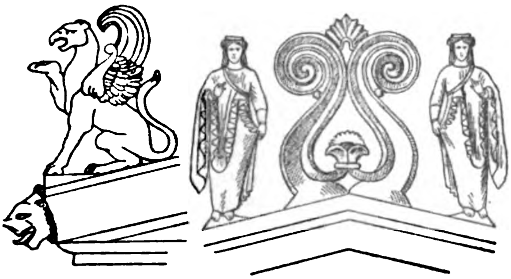
ACROPOLIS OF ATHENS.

A—Parthenon.
B—Foundation of Early Temple.
C—Museum.
D—Terrace.
E—Erechtheum.
F—Propylæa.
G—Precinct of Artemis Brauronia.
H—Temple of Victory.
I—Agrippa Pedestal.
J—Pinacotheca.
K—Altar to Rome and Augustus Cæsar.

ACROS′TIC (Gk. *ἄκρον*, *akron*, extremity, end + *στίχος*, *stichos*, line, verse). A Greek term for a number of verses, the first letters of which follow some predetermined order, usually forming a word—most commonly a name—or a phrase or sentence. Sometimes the final letters spell words as well as the initial, and the peculiarity will even run down the middle of the poem like a seam. Sir John Davies composed twenty-six *Hymns to Astrea* (Queen Elizabeth), in every one of which the initial letters of the lines form the words Elisabetha Regina.

In the acrostic poetry of the Hebrews the initial letters of the lines or of the stanzas were made to run over the letters of the alphabet in their order. Twelve of the psalms of the Old Testament are written on this plan. The 119th Psalm is the most remarkable. It is composed of twenty-two divisions or stanzas (corresponding to the twenty-two letters of the Hebrew alphabet), each stanza consisting of eight couplets, and the first line of each couplet in the first stanza begins in the original Hebrew with the letter *aleph*, in the second stanza with *beth*, etc. The divisions of the psalm are named each after the letter that begins the couplets, and these names have been retained in the English translation. With a view to aid the memory it was customary at one time to compose verses on sacred subjects after the fashion of those Hebrew acrostics, the successive verses or lines beginning with the letters of the alphabet in their order. Such pieces were called *Abecedarian Hymns.*

AC'ROTE'RION (Gk. ἀκρωτήριον, *akrōtērion*, the summit or extremity). A term in architecture for a statue or other ornament, often a palmette, placed on the apex or at one of the lower angles of a pediment.



ACROTERION.

ACT (Lat. *actus*, the doing or performing of a thing; *actum*, a public transaction, record). A term of law applied to the written expression of the will of the legislature formally declared. As commonly employed, it is synonymous with statute (q.v.). The term is derived from the *acta* of Roman public life, which comprehended all public official procedure as well as the official record thereof. An act of one legislature cannot tie the hands of its successors, unless it amounts to a contract, so that its repeal would come within the constitutional inhibition upon legislative acts which impair the obligation of contracts. In England even this exception does not exist, each Parliament being an absolutely sovereign legislature. Still, certain acts of Parliament have been passed in the hope, if not with the intention, of arresting "the possible course of future legislation;" and some of them have commanded a respect almost equal to that accorded in this country to written constitutions. To this class belong the Bill of Rights (q.v.); the Act of Settlement (12 and 13 Will. III., c. 2) fixing the descent of the crown; the Acts of habeas corpus (q.v.); the Acts of Union with Scotland (1 James I., c. 1), and with Ireland (39 and 40 Geo. III., c. 67); and the Septennial Act of 1716 limiting the life of a Parliament to seven years. "Act" is used in connection with other words in a number of familiar phrases. For example, *act of honor*, the acceptance by a stranger of protested paper for the honor of some party thereto; *act of God*, an inevitable accident resulting from superhuman causes, such as lightning, tempest, or floods; *act of state*, act done or commanded by the government of a foreign state, for which the person injured has no redress in the courts of his own country, but must seek redress through the diplomatic agencies of his government.

ACT. In the drama, the name for one of the principal parts of a play. In performance the acts are commonly separated by intervals, during which the dropped curtain conceals the stage. An act which may in turn be subdivided into scenes should be in a certain sense complete in itself, and at the same time should form an essential part of the whole drama. As every dramatic plot naturally divides itself into three parts—the exposition, the development, and the conclusion or catastrophe—a division into three acts seems most natural; but practically this would often require undue condensation, and the well-known classic custom defined by Horace in his *Ars Poetica* is that a play should be in five acts. Normally, the first act indicates the general nature of the drama, introduces the characters, and begins the action. The second act leads up to the third, which develops the crisis of the plot. In the fourth the conclusion or catastrophe is prepared, but should by no means be anticipated so as to weaken the effect of the *dénouement*, which is reserved for the fifth act. The Greeks did not make the formal distinction of acts in their drama, though Greek tragedies are subjectively capable of division into parts or episodes, which are indeed practically separated by the lyrical parts of the performance. (See CHORUS.) In modern drama the requirement for five acts began early to be neglected, especially in comedy. (See MOLIÈRE.) On the present stage plays are common in any number of acts below five. The four-act play is most common.

ACT, or CEREMONY OF "INCEPTION." The commencement or degree-taking formerly in use in English universities, but now discontinued (save as a form in Cambridge). The student or "respondent" who "keeps the act" reads a thesis in Latin which he defends against three "opponents" named by the proctors. Some such practice survives in most German universities. In a quaint pamphlet on *New England's First Fruits*, published in 1643, there is an account of the late commencement at Harvard in which the word "acts" is familiarly employed, as one may see from this extract: "The Students of the first Classis that have beene these foure yeeres trained up in University-Learning, for their ripening in the knowledge of the Tongues and Arts, and are approved for their manners, as they have kept their publick Acts in former yeares, our selves being present at them, so have they lately kept two solemne Acts for their Commencement, when the Governour, Magistrates, and the Ministers from all parts, with all sorts of Schollars, and others in great numbers were present, and did heare their Exercises."

AC′TA Diurna, Populi, Urbana, or Publica (acts daily, popular, municipal, or public). A sort of daily chronicle of events published in ancient Rome giving summaries of the principal legal and political orations, the decisions of the courts, news from the army, and the latest gossip of the town. They seem also to have contained accounts of the transactions of the assemblies of the people, also of births, deaths, marriages, and divorces, accidents, prodigies, and the like, all of which were preserved as sources of future history. When Antony offered Cæsar a crown on the feast of the Lupercalia, Cæsar ordered it to be noted in the Acta Diurna. The Acta are frequently said to have been introduced by Julius Cæsar, but others believe them to have existed long before Cæsar's time, and to have supplanted the *Annales*, which fell into disuse about the year 131 B.C. The Latin scholar Hübner has advanced strong arguments in support of the former view, although it was the practice before Cæsar's time for scribes to compile a manuscript chronicle of public events in the city of Rome, which was often forwarded with private letters to absent friends. The *Annales* took note only of the most important events, whereas matters of far less importance were included in the Acta Diurna. The material for the Acta was gathered by reporters called *actuarii*, and the Acta were exposed in public places to be read or copied by any who chose to do so. After a reasonable period of time they were taken down and preserved with other public documents. Persons in Rome were accustomed to keep their friends who were sojourning out of town informed of the progress of events and of the news generally, as gathered from the Acta Diurna. A passage in Petronius (cap. 53) gives an imitation of the Acta. From this it would appear that the style was very simple and that only the bare facts were stated. Consult: Le Clerc, *Des journaux chez les Romains* (Paris, 1838), a treatise to be read with caution; and Hübner, *De Senatus Populique Romani Actis* (Leipzig, 1860).

ACTÆ′A (Gk. ἀκτέα, *aktea*, elder tree). A genus of plants of the natural order Ranunculaceæ. *Actœa spicata*, the Baneberry or Herb Christopher, is a native of the north of Europe, found in bushy places in some parts of England. It is a perennial herbaceous plant, about 1 to 2 feet high, with triternate leaves, and the leaflets deeply cut and serrated, the flowers in racemes, the berries black and poisonous. A variety of *Actœa spicata* var. *rubra* with red berries, and *Actœa alba* with white berries are common in the United States, where they are known as Red and White Baneberry.

ACTÆ′ON (Gk. Ἀκταίων, *Aktaiōn*). A mythical personage, a grandson of Cadmus. He was trained as a hunter by Chiron. Having offended Artemis, he was changed by her into a stag and torn in pieces by his own dogs. The sin of Actæon is variously stated. According to Euripides, Artemis was jealous because Actæon had boasted that he excelled her in hunting. The most popular version in later times was that he had come upon the goddess while bathing.

AC′TA E′RUDITO′RUM (Lat. Proceedings of the Learned). A Latin monthly and the first German literary serial (117 volumes, 1682-1782). It was founded by Professor Otto Mencke of Leipzig, and was owned by his family till 1754, after which it rapidly deteriorated. The series contains a record of the progress of science to 1776.

AC′TA MAR′TYRUM (Lat. Acts of the Martyrs). A name given by the ancient Church to the records of the trials and deaths of the martyrs which were kept for the edification of the faithful. The oldest extant refer to the death of St. Ignatius of Antioch, who died about the year 107. St. Augustine (fifth century) speaks of these records as being read to the people on their festival days. Eusebius, the church historian (died about 340), collected the Acta Martyrum in his two works, *De Martyribus Palæstinæ* and *Synagoge Martyrum*, the latter of which has perished, but the former is the appendix to the eighth book of his *Church History*. See McGiffert's translation (New York, 1890).

AC′TA PILA′TI (Lat. Acts of Pilate). An account of the trial and death of Jesus Christ, purporting to have been written by Pontius Pilate or under his direction. Although Justin Martyr (Apol. i., 76-86), Tertullian (Apol. v., 21), and Eusebius (ii., 2) allude to some account rendered by Pilate to the Emperor Tiberius, the *Acta* now extant in the Vatican library, as well as the so-called *Report* of Pilate to the emperor and the alleged *Epistolæ Pilati* describing the resurrection, are admittedly spurious. Consult: Lipsius, *Die Pilatusacten* (Kiel, 1871). Various English translations have been published, e.g., *Acta Pilati* (Shelbyville, Ind., 1879), and also one in the Ante-Nicene library.

AC′TA SANCTO′RUM, or MAR′TYRUM (Lat. Acts of the Saints or Martyrs). The collective title given to several old writings respecting saints and martyrs in the Greek and Roman Catholic churches, but now applied especially to one extensive collection begun by the Jesuits in the seventeenth century, and intended to serve as a better arrangement of the materials found in ancient works. This great undertaking, which was commenced by the Jesuit Heribert Rosweyde, of Antwerp, has considerable importance, not only in a religious and ecclesiastical point of view, but also with regard to history and archæology. After Rosweyde's death in 1629, Johannes Bolland was commissioned by the order of the Jesuits to continue the work, and with the assistance of Godfried Henschen he prepared two volumes, which appeared in 1643. After the death of this editor (1665) the work was carried on by a society of learned Jesuits, who were styled "Bollandists," until 1794, when its further progress was prevented through the invasion of Holland by the French. In recent times the undertaking has been resumed, and in 1845 the fifty-fourth volume was published at Brussels. Several additional volumes have appeared since. The lives are arranged in the order of the calendar. A new edition of the first fifty-four volumes appeared in 1863-69. The sixty-fifth volume appeared in 1892. For notices of other and similar collections, see SAINTS; MARTYR and MARTYROLOGY.

ACTIAN (ăk′shan) **GAMES.** See ACTIUM.

AC′TINIA′RIA (Gk. ἀκτίς, *aktis*, ray). A group of anthozoan cœlenterates comprising the sea-anemones. They differ from all other anthozoans in the complete absence of a skeleton and in the large size of the individuals, which rarely form a colony. See ANTHOZOA and SEA-ANEMONE.

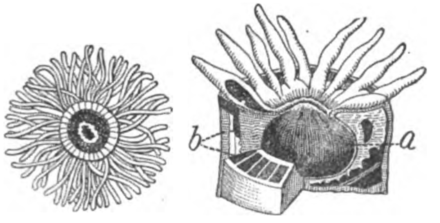


FIG. 1. FIG. 2.
ACTINIARIA.

1. Vertical aspect of an Actinarian, showing mouth and tentacles. 2. Sectional view: *a*, simple digestive sac; *b*, structure of the body-wall, showing septa.

ACTINIUM. A radioactive element discovered by Debierne in 1899. It occurs along with other radioactive substances in pitchblende and is chemically very similar to thorium, but is characterized by its high power of emanation. In 1902 Giesel discovered another substance, likewise possessing a high power of emanation, but chemically similar to lanthanum; he called it *emanium.* The question has since arisen whether actinium and emanium are not identical. Investigations carried out by Debierne, Miss Brooks, and Hahn and Sackur seemed to indicate that the two substances are identical. But a careful study led Marckwald, in 1905, to the remarkable conclusion that actinium and emanium are not identical, but are closely related to each other, inasmuch as *actinium is being continually produced from emanium.* Perhaps the most interesting fact about actinium is that, like radium, it is decomposing with the *formation of the element helium,* although actinium and radium are chemically very different substances. See RADIOACTIVITY.

ACTIN'OGRAPH (Gk. ἀκτίς, *aktis*, ray + γράφειν *graphein*, to write). An instrument for recording automatically the chemical effects of radiations from any source, especially the sun. The simplest forms of actinograph are those that expose standard photographic plates or films (iodides, chlorides, or bromides of silver) to the sun's action for short, definite periods of time. Those that utilize the union of chlorine and hydrogen under the influence of light, or the precipitation of gold from a solution of gold chloride and oxalic acid on exposure to light, cannot be readily employed for automatic registration.

ACTIN'OLITE (Gk. ἀκτίς, *aktis*, ray + λίθος, *lithos*, stone). A calcium-magnesium-iron amphibole (q.v.) that includes the varieties nephrite, asbestos (q.v.), smaragdite, and uralite. Actinolite varies in color from a bright green to a grayish green, and usually occurs in the form of long, slender crystals in metamorphic rocks, commonly in talc.

ACTINOLITE - SCHIST, or GRÜNERITE-SCHIST. A rock with a banded or foliated structure, which contains a considerable quantity of actinolite. Commonly the actinolite lies in single crystals or in sheaf-like aggregates in a fine grained ground-mass of quartz or of quartz and feldspar, and its common associate is iron oxide, particularly in the form of magnetite, although many other minerals may be present in smaller quantities. The actinolite-schists are common alteration products, under deep-seated conditions, of iron carbonate or ferrous silicate rocks, particularly in the vicinity of igneous masses. The famous iron-bearing formations of the Lake Superior country were originally mainly iron carbonate or ferrous silicate, and, by their alteration, have yielded iron ore on the one hand and actinolite- or grünerite-schists on the other. The term "schist" as applied to these rocks is frequently a misnomer. Schists show a parallel dimensional arrangement of their constituents, but commonly the actinolite crystals in so-called actinolite-schists show but a slight degree, if any, of parallelism. The parallel structure is really a more or less faint banding due to the segregation of different kinds of minerals into layers. See SCHISTOSITY.

AC'TINOM'ETER (Gk. ἀκτίς, *aktis*, ray + μέτρον, *metron*, measure). An instrument for measuring the effect of the sun's rays in producing chemical, i.e., actinic effects. As originally devised by Sir John Herschel, this title was applied by him to a thermometer whose bulb was filled with a blue solution of ammonia and sulphate of copper; the expansion of this solution by absorbing the sun's rays was supposed to measure the quantity of blue light or chemical rays in the beam of sunshine. At the present time it is known that actinometers, properly so called, measure only the effects of the energy transmitted to us in specific portions of the solar spectrum. In some arrangements this energy is all turned into heat and measured by its expansion effect. In other forms of apparatus it does molecular work of a chemical nature and is measured by these effects, as when a mixture of chlorine and hydrogen is converted into hydrochloric acid and the quantity of acid that is formed in years of time is the measure of the intensity. This includes the basis of the methods of Draper and Bunsen and Roscoe. When a mixture of ferric-oxalate and chloride of iron dissolved in water is exposed to sunshine it gives out carbonic acid gas; this is the basis of Marchand's apparatus. A photographic plate exposed for a short time receives an impression whose intensity may be measured on a scale of tints or shades and made the basis of a determination of the intensity of the sunshine. This method has been worked out by Bigelow and others. In general any apparatus for measuring the chemical effects of radiation from any source constitutes an actinometer properly so called, but the name is often improperly applied to apparatus that measures the total heating effect, as was the case in Herschel's apparatus; it is even now applied to the Arago-Davy and the Chwolson apparatus, all of which are, properly speaking, forms of pyrheliometer, and will be found described under that head.

AC'TINOM'ETRY. The general subject of the measurement of either the relative or the absolute effect of sunshine or other radiation either by visual, thermal, or chemical methods. This term is now being replaced by the more proper word radiometry.

AC'TINOMOR'PHY (Gk. ἀκτίς, *aktis*, ray + μορφή, *morphē*, form, shape). In botany, a term of symmetry used chiefly in connection with flowers. In an actinomorphic flower the members of each set are similar and arranged about a common centre, as are the parts of a radiate animal. If there are five petals, they are alike and are evenly distributed about the centre of the flower, as are the spokes of a wheel about the hub. Technically defined, an actinomorphic flower is said to have as many planes of symmetry as there are members in a cycle. This means that if an imaginary plane be run through each sepal or petal or stamen and the common centre, the two resulting halves of the flower will be similar. More commonly such flowers are spoken of as "regular." See FLOWER.

ACTINOMYCO′SIS (Gk. *ακτίς*, *aktis*, ray, beam + *μύκης*, *mykēs*, mushroom, fungus, excrescence), LUMPY JAW, or BIG JAW. A specific, infectious disease produced by a parasitic micro-organism known as the Ray fungus (*Actinomyces bovis*). The micro-organism causes local affections in the form of tumors (*Actinomycomata*) of the bone and other tissues. The disease is usually of sporadic occurrence, but sometimes takes the form of an enzoöty. It is most frequently found in cattle, but affects also horses, pigs, sheep, deer, llama, guanaco, and man. Actinomycotic tumors in cattle have been recognized since 1825, although they have frequently been mistaken for cancerous, tuberculous, and other kinds of tumors. The disease occurs in all parts of Europe and North and South America. The Ray fungus is found in all tumors and abscesses of this disease, wherever situated, and its presence may be detected by the form of small yellow spots in the muscles and soft tissues of affected animals. When slightly magnified these spots are seen to consist of a radiating structure, which is characteristic of the growth of the ray fungus. In cattle the seat of the disease is usually in the inferior maxillary bones, submaxillary salivary glands, in the tongue, pharynx, and œsophagus. The common names, Big Jaw, Lumpy Jaw, Big Head, and Wooden Tongue are descriptive of the most frequent forms of actinomycosis in cattle and horses. When the maxillary bones are affected, a large bone tumor is formed which shows a highly vacuolated cancellate structure. As to the local seat of the affection, in hogs actinomycosis is found in 80% of cases in diseases of the udder. In a small percentage of cases the lungs and intestines are affected. Maxillary tumors in cattle are almost invariably due to the Ray fungus, and therefore actinomycosis may be readily diagnosed.

Considerable difference of opinion prevails regarding the systematic position of the Ray fungus. It has been supposed that the organism has a plant host on which it passes part of its life cycle. The agency of various grasses (especially such as have sharp-pointed awns) in transmitting actinomycosis can hardly be questioned. About 500 cases of this disease in man have been reported in the medical journals, the greater number of cases having occurred as a result of eating raw meat.

Actinomycosis is peculiar in that it yields to a direct specific treatment. In 1885 Thomassen showed that recent cases of the disease could be cured by the internal administration of potassium iodide. In treating actinomycosis in cattle the ordinary practice is to give daily doses of eight to twelve grams of potassium iodide for weekly periods, alternating with shorter periods, in order that the animals may recover from the symptoms of iodism. Actinomycosis follows a slow chronic course of development.

The relationship of the disease to the public health has been much discussed. Apparently infection most frequently takes place in man and cattle through diseased teeth or abrasions of the mucous membrane of the mouth. The identity of actinomycosis in man and cattle is admitted by nearly all investigators, but most authorities hold that its direct transmission to man through eating the meat of affected animals is of rare occurrence. Whether an animal affected with actinomycosis should be used for human food is a question the answer to which depends upon a variety of circumstances. It may, however, be safely asserted that animals in which the disease has become generalized should be condemned. For details concerning actinomycosis consult D. E. Salmon, "Investigations Relating to the Treatment of Lumpy Jaw, or Actinomycosis, in Cattle," *U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin 2* (Washington, 1893); D. E. Salmon and others, "Special Report on Diseases of Cattle and on Cattle Feeding," *Report of U. S. Department of Agriculture for 1904, Bureau of Animal Industry* (Washington, 1904); "Tumeurs des mâchoires observées dans l'espèce bovine," *Journal de Médecine Vétérinaire* (Paris, 1826).

AC′TINOZO′A. Same as ANTHOZOA (q.v.).

AC′TION (Lat. *actio*, a doing, performing, an action, suit, process). A term which, in its broadest sense, includes every lawful proceeding in a court of justice for the enforcement or protection of a right, the redress or prevention of a wrong, or the punishment of a public offense. Formerly the term was confined, in English law, to an ordinary proceeding in a common law court, while the word *suit* was applied to a proceeding in equity. By the reformed procedure in many of our States, all distinction between actions at common law and suits in equity, as well as between the different forms of common law actions, have been abolished, and only a single civil action is recognized. If the prosecution is not instituted and carried on by one party against another, it is denominated by some statutes a *special proceeding* (q.v.). The earliest classification of common law actions was: (1) real actions, or those based on the plaintiff's right of property in specified lands, so called because the *res*, or property itself, was sought to be recovered; (2) mixed actions, such as those for partition of lands, for ejectment or for waste; (3) personal actions, or those against a particular person for a money judgment. The distinction between real and personal actions is the foundation of the classification of property as real and personal. (See PROPERTY.) This third class was subdivided into actions *ex contractu*, such as debt (q.v.) and covenant (q.v.), and actions *ex delicto*, such as trespass (q.v.) and detinue (q.v.). Again, actions are divided into local and transitory, according as they must be brought in a certain county or state, or as they may be brought wherever the defendant is found. An action for trespass to land is local, and it must be brought in the State where the land is situated; while an action for slander of title (q.v.) to that land is transitory. (See the authorities referred to under the various titles above named.) The action of account at common law was used much earlier than, and is distinct from, the action upon an account stated, which came into the law as a common count (q.v.). The action of account would lie at common law, and by early English statute against one acting in a fiduciary capacity other than a trustee, or against one whose duty it was to render an account to the plaintiff, to compel the defendant to render an account and to pay the amount due on such accounting.

ACTION. In psychology, a term used broadly to cover all forms of muscular movement. We speak, e.g., of the action of the heart, or reflex action, etc., as well as of impulsive or voluntary action. There is, however, a growing tendency to reserve the word action for such bodily movements as have conscious antecedents and concomitants (movements for which there are conscious motives, and of which we are conscious, as they run their course in time), and to employ the general term "movement" for movements which are of an unconscious, purely physiological, character. We shall therefore speak in this article of impulsive and voluntary *action*, but of reflex *movement*.

The problem which action sets to psychology is twofold. We have, in the first place, to trace the genesis and development of action; and in the second to analyze the active consciousness, to determine the constituent processes in the various forms of motive.

1. There are two opposed theories of the genesis of action. The first asserts that all conscious actions have developed from reflex movements. The reflex movement is the direct and definite response of the organism to a particular stimulus. A frog whose brain and medulla have been removed will draw up its leg if the foot be pinched; the pupil of the human eye contracts under the influence of light, and expands again as the light is diminished. Mechanical and unconscious movements of this kind are, the theory holds, older than consciousness. When mind appears, it finds such movements ready to its hand; it avails itself of them for conscious purposes. So the animal's movements, at first automatic and simple, grow more and more complex, and have more and more of the element of consciousness imported into them. The main arguments for the position are as follows. (*a*) Spontaneous movements are to be observed in children and young animals: movements that are neither reflex movements nor voluntary actions, but random discharges of the excess of energy stored in the healthy organism. These movements furnish a varied supply of active experience, certain items of which must, by the law of chance, prove to be positively pleasurable, while others will at least be less unpleasant than the experiences preceding them. Whenever active experience and pleasure are thus coincident, attention is drawn to the movement, which is elaborated into voluntary action. (*b*) From the physiological point of view, the movements of the lowest organisms, as well as the movements carried out by means of the lower nerve-centres of higher organisms, are of the reflex type. And even the most complex of voluntary actions can be assimilated to this type on the neural side; for the physical correlate of such action is simply the reflex arc, with its central portion made longer and more circuitous.

Neither of these arguments is, however, free from objections. In the first place, different observers differ as to the range and scope of the spontaneous movements of infancy. Some restrict them within very narrow limits, where the play of chance coincidence would be inconsiderable; others assert that they can, one and all, be reduced to incipient voluntary actions and imperfect hereditary reflexes. Moreover, the theory presupposes that the sensations and perceptions aroused by moving appear, in point of time, before the pleasure achieved by the movement or the voluntary impulse toward it. But this means that mind is built up piecemeal, whereas there is reason to think that consciousness is a single tissue, every strand of which is given with every other. Again, it is difficult to understand the mechanism by which pleasurable movements are selected. Granted that a movement chances to bring pleasure, how is its repetition brought about? Can we form any clear idea of the way in which a motive is prefixed to the sensation series? Against the second argument, it is asserted as evident that the simplest form of sensory-motor coördination need not be the earliest. There is a primitive simplicity: but there is also a simplicity of reduction and refinement. Again, the statement that the movements of the lowest organisms are reflex in character is said to beg the question: the original theory assumes outright that there is a strict parallel between the growth of the race and the growth of the individual, between phylogeny and ontogeny, and does not take into account the fact that the individual comes into the world endowed with a rich inheritance of neuro-muscular coördinations. And, lastly, even if the neural substrate of voluntary action be in structure no more than a highly complex reflex arc, still the opponents of the theory point out functional differences: the reflex is unconscious, while the functioning of the central cells of the voluntary arc is accompanied by consciousness. So we come face to face once more with our original problem.

The alternative theory, which we may now examine, affirms that the earliest organic movements are, in principle, voluntary actions. Mind, according to this theory, is as old as life, and the first movements of living matter are impulsive actions, i.e., actions prompted by a single determining motive. The arguments which this position brings into the field are as follows. (*a*) All reflex and instinctive movements show signs of adaptation; they subserve a particular end or purpose; they are definite and appropriate responses to certain circumstances of the animal's environment. Now, in the first place, primitive movements should be vague and purposeless; it is not easy to conceive of a movement that should be at once rudimentary and economical. And, in the second place, our best criterion of the presence of mind in a living creature is the creature's capacity of adaptation, of learning. The reflex, pointing as it does to a process of adaptation in the past, points also to the existence of a past mind. In a word, reflex movements appear to be degenerate, mechanized impulsive actions. (*b*) There can be no doubt that such mechanization is possible. We are constantly in the course of our everyday life reducing voluntary actions to "secondary reflexes": our pen dips itself in the accustomed inkstand, our coat buttons itself, our bicycle balances itself, without any of the conscious attention that we gave them when the movements were new. Further, what we see happening here in the course of a few days or weeks has happened also in the life of the race. We wince when we are ashamed, and jump when we are startled; and the jump and wince are inexplicable unless they are the degenerate descendants of voluntary actions, the last reflex remnants of the cowering and shrinking and leaping aside of the frightened animal.

The only question which this second point of view leaves unanswered is the mode of origin of the first impulse. How and under what conditions the primeval organism became conscious of the impulse to move, and organic movement appeared in the natural world, we cannot say. But neither is psychology called upon to say. No science explains its own data; it takes them for granted. As, therefore, the physicist assumes the mechanical universe, and the biologist the phenomena of life, so may the psychologist assume without cavil the existence of mind. Granted the starting-point, and the rest follows easily enough. The first organic movement is an "action upon presentation," an action whose motive (the impulse) is given with the presentation to the animal of a pleasantly or unpleasantly toned stimulus. Out of this grows impulsive action proper, an action whose motive is blended of three ideas: that of the stimulus, the original motive-idea; that of the result of movement, of pleasurable accomplishment; and that of the moving itself, the "active experience" of the first theory. The course of development beyond impulsive action takes two directions. Upward, toward greater mentality, it rises to the more complex forms of voluntary action: to selective action, in which there is a conflict of impulses, a period of deliberation, resulting in the victory of some one (the actual) motive over other less strong (potential) motives; and to volitional action, in which the conflict is not between impulse and impulse, but between an impulse to movement on the one hand and a group of ideas prompting to no-action on the other. Downward, toward less mentality, the impulsive action degenerates into the reflex movement. Selective and volitional action, as we have seen, may also degenerate; choice and resolve become automatic; the complex action slips back, first of all into an impulsive act, and finally into a secondary reflex. Note the light which this view of the development of action throws upon the problems of animal psychology (q.v.). Bethe thinks that ants and bees are automata, while popular psychology dowers them with all sorts of conscious motives and purposes. Now, ants and bees prove, on trial, to be unintelligent; they cannot learn to make new adaptations. On the other hand, the adaptations which they have already learned are of an extremely complicated character. It has been assumed, therefore, by certain authorities that these creatures represent the final stage in a retrogressive development from a fairly high level of mentality. According to this theory popular psychology is right, in that ants and bees once possessed a good deal of mind; it is wrong in interpreting their present movements as voluntary actions. If it be objected that the unicellular organisms, the most primitive forms of life, should (on the present theory) show signs of rudimentary impulsive action, and that they prove, on trial, to be as automatic as Bethe's ants, the reply may be that these protozoa, simple as they are, have as long a line of ancestry as we have ourselves; and that the less mind there is to start with, the less will be the fall from impulse to the reflex. But many qualified observers deny this total absence of mind. In general, then, it is asserted by the supporters of this hypothesis that if a sound view of mental evolution is to be attained, the investigator must accept the idea that all animals have had mind. Whether or not they have it now depends upon the direction which their development has taken—upward, toward physiological adaptability and elaboration of mental process, or downward, toward specific adaptation and the lapse of consciousness.

2. We have already said something by way of analysis of the "typical" motive to action, the impulse. On its intellectual side, this motive, in complete form, contains the three ideas (1) of the object which evokes the movement, (2) of the movement itself, and (3) of the result which the movement accomplishes. The affective accompaniment of this group of ideas may be pleasurable or unpleasurable, but must always be the one or the other; we may jump for joy or from fright, but we do not jump when our mood is that of indifference. The essential thing in the active consciousness, however, is an apperception of (attention to) some one of the ideas contained in the motive. (See APPERCEPTION; ATTENTION.) (*a*) In the case of primitive action (action upon presentation) we must suppose that the idea of object is the idea that stands in the focus of attention; the impulsive action is indistinguishable from the movement that expresses emotion. (See EXPRESSION; EXPRESSIVE MOVEMENTS.) "The universal animal impulses—the impulses of nutrition, of revenge, of sex, of protection, etc.—are indubitably the earliest forms of emotion" (Wundt). The hungry animal perceives food: its attention is held by this perception; it is pleasurably moved by the perception; and bodily movement toward the food-supply results. (*b*) As the organism grows in experience of movement, the impulse becomes more complex, and the focus of attention shifts to the idea of our own movement (action upon representation); so that we may lay it down as a law of analytical psychology that the condition of voluntary action is an apperception of the movement-idea. We think of ourselves as moving, and find that we have moved. (*c*) At a still later stage, when the voluntary action is taking the downward path toward the secondary reflex, the idea of movement fuses with the idea of result into an indissoluble whole. It is now the idea of result that holds the attention. We feel a draught, and rise at once to close the window, thinking neither of the object of movement, the window, nor of the muscular movements that take us to it, but simply of the result of the action, the avoidance of a cold. So the emphasis shifts from term to term of the threefold complex; from idea of object to idea of movement, and from that again to idea of result. But the motive remains in principle the same thing: an affectively toned group of sense-material, given in the state of attention.

The conscious antecedents of the higher forms of voluntary action are naturally more complicated. In place of the triad of simple ideas we have, in the conflict of impulses that precedes volitional and selective action, elaborate systems or constellations of ideas, representations of the total "situation" in which we find ourselves. In place of the simple pleasantness or unpleasantness of the impulse, we have equally elaborate affective formations—emotions and sentiments; the feelings of obscurity, of contradiction, of resolve, of decision; the characteristic oscillatory emotion of doubt; the emotions of relief, of satisfaction or dissatisfaction, of hope, of disappointment; the sentiments of power, of pride, of æsthetic fitness, of moral rightness. (See EMOTION.) And in place of the passive attention which the single impulse-motive commands, we have an active, effortful attention divided among the various potential motives contained in the "situation." It is the business of descriptive psychology to unravel the processes of these motive-consciousnesses, and to trace the single pattern (the impulse pattern) that runs through them all. It is the business of experimental psychology to examine the impulse under standard conditions; to build it up from the given elements, and to construct artificial selective and volitional actions from a number of simple impulses. This task it accomplishes by aid of the reaction experiment. Consult: A. Bain, *The Emotions and the Will* (London, 1880); H. Spencer, *Principles of Psychology* (New York, 1881); W. Wundt, *Vorlesungen über die Menschen- und Tierseele* (3d ed., Leipzig, 1897; trans. as *Human and Animal Psychology*, London, 1896). id., *Grundzüge der physiologischen Psychologie* (5th ed., Leipzig, 1902-03).

AC'TIUM, ăk'shĭ-ŭm, now **AKRI**. A town and promontory on the west coast of Greece at the entrance of the Ambracian Gulf, now the Gulf of Arta. It is memorable for the sea fight which took place near it September 2d, 31 B.C., between Octavius (afterward the Emperor Augustus) and Marcus Antonius. These two had for some time ruled the Roman world jointly, the former in the west, the latter in the east. It now came to a struggle for the sole sovereignty. The two armies were encamped on the opposite shores of the gulf. Octavius had 80,000 infantry, 12,000 cavalry, and 260 ships of war; Antony, 100,000 infantry, 12,000 cavalry, and 220 ships. Antony's ships were large and well provided with engines for throwing missiles, but clumsy in their movements: Octavius's were smaller and more agile. Antony was supported by Cleopatra, Queen of Egypt, with sixty vessels, who induced him, against the opinion of his most experienced generals, to determine upon a naval engagement. The battle continued for some hours undecided; at last Agrippa, who commanded Octavius's fleet, succeeded by a skillful manœuvre in compelling Antony to extend his line of battle, the compactness of which had hitherto resisted all attempts of the enemy to break through. Cleopatra, whose ships were stationed behind Antony's line, apprehensive of that line's being broken, took to flight with her auxiliary fleet, and Antony recklessly followed her with a few of his ships. The deserted fleet continued to resist bravely for some time, but was finally vanquished; the land army, after waiting in vain seven days for Antony's return, surrendered to Octavius. As a memorial of the victory that had given him the empire of the world, and out of gratitude to the gods, Octavius enlarged the temple of Apollo at Actium, dedicated the trophies he had taken, and instituted games (Ludi Actiaci) to be celebrated every five years. He also built on the spot where his army had been encamped the town of Nicopolis (city of victory), near where Prevesa now stands. The battle of Actium is described in Greek by Plutarch (*Life of Antony*) and by Dion Cassius (bk. l.). See ANTONIUS, MARCUS; AUGUSTUS; CLEOPATRA.

ACT OF FAITH. See AUTO-DA-FÉ.

ACT OF PARLIAMENT, pär'lĭ-mĕnt. A resolution or law passed by all the three branches of the English legislature, the king (or queen), lords, and commons; or, as it is formally expressed, "by the King's Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in Parliament assembled, and by the authority of the same." An act of parliament thus made is the highest legal authority acknowledged by the constitution. It binds every subject, and, with a few exceptions, every alien in the land, and even the sovereign himself, if named therein. And in England it cannot be altered, amended, dispensed with, suspended, or repealed but in the same forms and by the same authority of parliament. In Scotland, however, a long course of contrary usage or of disuse may have the effect of depriving a statute of its obligation; for by the Scotch law a statute may become obsolete by disuse and cease to be legally binding. It was formerly held in England that the King might in many cases dispense with statutes, especially such as were of a penal character; but by the statute 1 W. and M., st. 2, c. 2, it is declared that the suspending or dispensing with laws by royal authority without consent of parliament is illegal.

An act of parliament is either public or private. A public act regards the whole empire or one of its main subdivisions, in which case it is *general;* or a subordinate part, in which case it is *local;* but the operation of a private act is confined to particular persons and private concerns. As the law till lately stood, the courts of law were bound *ex officio* to take judicial notice, as it is called, of public acts—that is, to recognize these acts as known and published law, without the necessity of their being specially pleaded and proved; but it was otherwise in regard to private acts, so that in order to claim any advantage under a private act it was necessary to plead it and set it forth particularly. But now, by the 13 and 14 Vict. c. 21, s. 7, every act of parliament is to be taken to be a public one, and judicially noticed as such unless the contrary be expressly declared.

An act of parliament begins to operate from the time when it receives the royal assent, unless some other time be fixed for the purpose by the act itself. The rule on this subject in England was formerly different, for at common law every act of parliament which had no provision to the contrary was considered as soon as it passed (i.e., received the royal assent) as having been in force retrospectively from the first day of the session of parliament in which it passed, though in fact it might not have received the royal assent, or even been introduced into parliament, until long after that day; and this strange principle was rigidly observed for centuries. The ancient acts of the Scotch parliament were proclaimed in all the county towns, burghs, and even in the baron courts. This mode of promulgation was, however, gradually dropped as the use of printing became common, and in 1581 an act was passed declaring publication at the Market Cross of Edinburgh to be sufficient. British statutes require no formal promulgation, and in order to fix the time from which they shall become binding it was enacted by 33 Geo. III., c. 13, that every act of parliament to be passed after April 8, 1793, shall commence from the date of the indorsement by the clerk of parliament stating the day, month, and year when the act was passed and received the royal assent, unless the commencement shall in the act itself be otherwise provided for.

Acts of parliament are referred to by the year of the sovereign's reign, and the chapter of the statutes for that year. They were first printed in the reign of Richard III., originally in Latin, but since the fourth year of Henry VII. in English. The collective body of such acts constitute the Statutes of the Realm. See STATUTE; PARLIAMENT, and the authorities there referred to.

ACT OF SET'TLEMENT. The second chapter of Statute 12 and 13, William III. of Great Britain (1701), which provided that the crown, in default of issue to Anne Stuart, William's presumptive successor, should descend to the House of Hanover, and which excluded Roman Catholics from the throne. See ELIZABETH STUART (Queen of Bohemia).

ACT OF U'NIFOR'MITY. The English statute of 13 and 14 Car. II., c. 4, 1662, which provides that the Book of Common Prayer, as then recently revised, should be used in every parish church and other place of public worship in England, and that every school-master and person instructing youth should subscribe a declaration of conformity to the liturgy, and also to the effect of the oath and declaration mentioned in the act of 13 Car. II., st. 2, c. 1. It further enacted that no person should thenceforth be capable of holding any ecclesiastical promotion or dignity, or of consecrating or administering the sacrament, till he should be ordained priest according to Episcopal ordination, and with respect to all ministers who then enjoyed any ecclesiastical benefice it directed that they should, within a certain period, openly read morning and evening service according to the Book of Common Prayer, and declare before the congregation their unfeigned assent and consent to the use of all things therein contained, upon the pain of being deprived of their spiritual promotions. Two thousand of the clergy who refused to comply were deprived of their preferments. Acts to secure uniformity were passed under Edward VI. (1549) and Elizabeth (1559).

ACTON, ăk'ton. A suburb of London, England. During the Civil Wars it was one of the strongholds of Puritanism, and has been at various times the place of residence of many famous personages, such as the great jurist Sir Matthew Hale, the novelist Henry Fielding, and the actress Mrs. Barry. Pop., 1891, 24,200; 1901, 37,700.

ACTON, JOHN EMERICH EDWARD DALBERG, first baron (1834-1902). An English historian, born at Naples. He studied under Dr. (afterward Cardinal) Wiseman at St. Mary's Oscott, but received his education chiefly from Dr. Döllinger, whose "Old Catholic" views he adopted, and zealously opposed the dogma of papal infallibility. He was regarded as the leader of the "Liberal Roman Catholics" in England. As Sir John Acton, he was a member of Parliament for Carlow (1859-65). In 1869 he was raised to the peerage. He edited and contributed articles to magazines, and won a high reputation both for learning and for vigor of expression. In 1895 he was appointed regius professor of modern history at Cambridge. His inaugural address was published under the title, *Lecture on the Study of History* (1895). He projected the monumental Cambridge Modern History.

ACTON, SIR JOHN FRANCIS EDWARD (1737-1811). Prime minister of Naples under Ferdinand IV. He was born at Besançon, France, the son of an English physician. He served in the Tuscan navy, commanding a frigate in the expedition against Algiers in 1775. He showed such ability that he was invited to reorganize the Neapolitan navy, and soon became commander-in-chief of the sea and land forces, then minister of finance, and finally prime minister. His measures were intolerant, and ultimately caused a reaction against the royal family of Naples and in favor of the French party and the Carbonari. When the French entered Naples in 1806 he fled to Sicily, where he died.

ACTON, THOMAS COXON (1823-98). An American financier and administrator. He was born in New York City, and served as assistant deputy county clerk (1850-53) and as deputy register. He was a police commissioner of the New York metropolitan police in 1860-69, and during the last seven years was president of the board. His most valuable service while in that office was during the draft riots in 1863, when for a week he personally commanded the entire police force of the city.

ACTS, SPURIOUS or APOCRYPHAL. See APOCRYPHA, section on *New Testament.*

ACTS OF HOSTIL'ITY. Acts which may involve nations in war. The tremendous cost of modern war, both in blood and treasure, is now so keenly felt that war is rarely resorted to except as the court of last resort. The growing and widespread demand for universal arbitration is also tending to limit the causes which may produce war, and the strength of this tendency was evidenced by the call of the Czar of Russia for an international conference, which was held in 1899, and is known in history as the Hague Peace Conference. Acts of hostility may be of a diplomatic, commercial, civil, or military character. The angry nature of the French ambassador's (Count Benedetti, q.v.) interview with the King of Prussia at Ems in 1870 is an example of a hostile diplomatic act. The French embargo on British ships after the peace of Amiens (q.v.) is an example of the commercial phase; the firing at an armed vessel of a friendly nation, or the invasion of territory, is a military example; and the detention of non-belligerents, citizens of a friendly nation, as in the case of France and England (1803), is an example of a civil act of hostility.

ACTS OF PI'LATE. See ACTA PILATI.

ACTS OF THE APOS'TLES (Gk. Π*ράξεις τῶν 'Αποστόλων, Praxeis tōn Apostolōn*). The fifth book of the New Testament, the composition of which is ascribed by tradition and by the general consent of critics to the same author as that of the Third Gospel, to which book it forms a sequel. As the Gospel was written after the destruction of Jerusalem (70 A.D.), the date of Acts is still later, being not before 75 A.D., and not after 95 A.D., most likely about 80 A.D. Its place of composition is not possible to determine. Its purpose is apparent from the plan on which its material is selected and arranged, wher compared with the declared purpose and evident plan of its antecedent book. (See LUKE, GOSPEL OF.) It is to place before Theophilus, who was either a convert from paganism, or, if yet a pagan, well on the way toward an acceptance of Christianity (see THEOPHILUS), the development of the religion of Jesus from its old life in Judaism to its new life in Gentilism as providentially directed and so originally intended by its divine founder. There may have been a secondary purpose, to show, by the favorable reception and treatment which this religion received from Roman officials, that there was no disposition on the part of the Government to consider Christianity in a hostile light. Such a secondary purpose would be the more likely if Theophilus were yet himself a pagan and the book were composed in the early Flavian régime, when Christianity was under imperial suspicion. (See PERSECUTIONS OF THE CHRISTIANS.)

The material of the book is derived partially from outside sources, both oral and written, the presence of which is specially evident in the first twelve chapters, which treat of the experience of the early church in Jerusalem and Judea, and partially from personal notes of the missionary experiences of Paul and his companions, taken, as the critical facts in the case would seem to make clear, by the author himself, who thus becomes a companion of Paul. As to the identity of this companion there would seem to be no valid reason against the tradition that he was Luke, mentioned in Paul's Epistles as standing in close relationship to the Apostle. (See Colossians iv : 14; II. Timothy iv : 11; Philemon, verse 24.) This is the general opinion of criticism.

Two schools of criticism have attempted to disparage the credibility of Acts, the Tübingen School (1845), which held it to be a tendency writing, so manipulating the narrative in the interests of the union movement of the Church in the second century as to destroy all accuracy of facts, and the Documentary School (1890), which held it to be a complex composite writing, made up of such variant documents, of such varied origins, and of such differing degrees of reliability as to hopelessly obscure the actual facts of the history. Neither of these attempts has proved successful. At present there is an effort among critics to subject it to the same process of literary criticism as has been so largely employed in the Old Testament. This would present it as a writing which not only gives us a history of the early times of which it tells, but in the way in which it gives that history so reflects the later times in which it was written as to give us a picture of its own age. By these critics it is held to be a composite writing of not earlier origin than the reign of Domitian (81-96 A.D.), compiled by a Gentile Christian, not Luke nor any companion of Paul, and, outside of the personal diary sections in the latter half of the book, which may have come from Luke, of no necessary historical accuracy.

Professor Blass of Halle has suggested that it was written originally in two texts, a longer and a shorter one, the former being the earlier, and represented in the text of the peculiar Codex Bezæ (D), the shorter being the later and represented in the canonical text of the Testament.

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AC′TUA′RIAL SOCI′ETY OF AMER′ICA. An organization for the promotion of actuarial science. It was founded in 1889 and in 1905 had 160 members and associates.

AC′TUARY (*Actuarius*, in ancient Rome, meant a clerk who recorded the *acta* (q.v.) of the senate and other public bodies, and also an accountant). In recent times, a term applied to the officers of life insurance companies and cognate enterprises, who supply the calculations upon which their business rests. As these calculations involve questions of the probable duration of human life, as well as those of interest and costs, the function of the actuary might be briefly defined as the application of the doctrine of probabilities to the affairs of life. See PROBABILITIES.

AC′UPRES′SURE (Lat. *acus*, needle + *pressura*, pressure). A mode of arresting hemorrhage from bleeding vessels. A needle is passed through the flaps or sides of the wound, or the tissues at the sides of the vessel, so as to cross over and compress the orifice of the bleeding artery, just as in putting a flower in the lapel of one's coat one crosses over and compresses the flower-stalk with a pin pushed twice through the lapel. Surgeons now seldom use acupressure.

AC′UPUNC′TURE (Lat. *acus*, needle + *punctura*, a pricking). A very ancient remedy, and one practiced extensively in the East, for the relief of pain, swelling, or dropsy. Steel needles are made use of, about three inches long, and set in handles. The surgeon, by a rotatory movement, passes one or more to the desired depth in the tissues, and leaves them there from a few minutes to an hour. The relief to pain afforded by this simple operation is sometimes astonishing, and the wounds are so minute as to be perfectly harmless. The needles are sometimes used as conductors of the galvanic current to deep-seated parts, for the destruction of moles, birthmarks, etc., and are sometimes made hollow to allow of a small quantity of some sedative solution being injected into the tissues by which pain may be almost immediately relieved. See Neuralgia.

ADA, ŏd′ŏ. A town of the kingdom of Hungary, situated on the Theiss, about 30 miles south of Szegedin (Map: Hungary, G 4). The inhabitants are chiefly engaged in the cultivation of grain and cattle raising. Pop., 1900, 12,112.

ADAGIO, ȧ-dä′jȯ (Ital., slowly, leisurely, from *ad agio*, at ease). In music, primarily a slow tempo intermediate between *largo* or *grave* and *andante*. The term is further applied to the slow movement (usually the second) of a musical composition, as, e.g. of a symphony, sonata, concerto, or overture. It serves as a contrast with the rapid and energetic preceding (allegro) and following (scherzo) movements of the work, and affords scope for a flowing and expressive slow melody with a gracefully varied accompaniment, which breaks up the monotony of the adagio and heightens its effect. A clear and expressive execution of an adagio is an unfailing test of the artistic standing of a performer, as it demands a pure and beautiful intonation, a true reading and phrasing of the cantilena even in its most minute details, and a careful attention to all points of effect. The old masters, Haydn, Mozart, and Beethoven, have left in their works the finest specimens of the adagio.

ADAIR, ȧ-dâr′, James. An Indian trader and author. He lived for almost forty years among the southern Indians, and chiefly among the Chickasaws, and in 1775 published a valuable work entitled *The History of the Indian Tribes, Particularly Those Nations Adjoining the Mississippi, East and West Florida, Georgia, South and North Carolina, and Virginia.* Though impaired in value by the author's zealous advocacy of the Jewish origin of the Indian race, this book gives one of the best first-hand accounts ever written of the habits and character of the native tribes, besides containing an incomplete but valuable vocabulary of various Indian dialects. Adair's theory of the origin of the Indians was adopted and elaborated by Dr. Elias Boudinot in his *Star of the West, or An Attempt to Discover the Long-Lost Tribes of Israel* (1816).

ADAIR, John. (1759-1840). An American soldier. He was born in Chester County, S. C., but removed to Kentucky in 1787. He served as major in General St. Clair's Indian expedition of 1791, and was defeated by "Little Turtle" in November. He was a member of the Kentucky Constitutional Convention (1792), and was a United States senator from 1805 to 1806. He served as volunteer aid to General Shelby in the battle of the Thames (October 5, 1813), and, as brigadier-general of militia, commanded the Kentucky troops at New Orleans in 1815. He was governor of Kentucky (1820-24), and a member of Congress (1831-33).

ADAIR, Robin. See Robin Adair.

ADAL, ȧ-däl′. A narrow tract of land in East Africa extending along the Red Sea from the Gulf of Tajura to Massowah (Map: Africa, J 3). The larger part is included in the present Italian colony of Eritrea (q.v.), while the southern end, bordering on the Gulf of Tajura, is under the protectorate of France. Its inhabitants are the Danakil.

AD′ALBERT (?-1072). A German prelate. He was made Archbishop of Bremen in 1043 by Henry III., whom he accompanied to Rome, where he declined the proposed candidacy for the papacy, when he might have been elected. Leo IX. made him his legate in the north. During the minority of Henry IV., Adalbert and Archbishop Hanno, of Cologne, usurped the administration of the empire; but he became obnoxious to the princes and they succeeded in separating him from the Emperor. He soon after regained his influence, however, and kept it as long as he lived. His dream was to unite Germany, England, and Scandinavia into a patriarchate independent of Rome.

ADALBERT (?-997), Saint. A Bohemian prelate improperly styled "the apostle of the Prussians," whose original Bohemian name was Voitech (comfort of the host). He was educated at Magdeburg, and in 983 was chosen Bishop of Prague, but soon wearied of the perpetual strife with the essentially heathen Bohemians and retired to a monastery near Rome. He went back to Prague in 992, but again retired in discouragement, and finally went as a missionary to the Poles and Prussians, and was murdered by a heathen priest April 23, 997. He was first buried at Gnesen, and then transferred to Prague and put in a vault, where his bones were discovered in 1880, and deposited in the cathedral. For his life, consult C. Heger (Königsberg, 1897), H. G. Voigt (Berlin, 1898).

ADALIA, ȧ-dä′lē-ȧ (ancient Attalia). The chief seaport of the Turkish vilayet of Konieh, situated on the southern coast of Asia Minor, in lat. 36° 52′ N., long. 30° 45′ E., about 200 miles southeast of Smyrna (Map: Turkey in Asia, D 4). The streets rise like the seats of a theatre up the slope of the hill. The town, built on a rocky hill, with its streets rising in terraces and studded with and surrounded by beautiful gardens of orange, fig, and mulberry trees, is very picturesque. It has a considerable trade in timber, wheat and other agricultural products. Pop., about 30,000, including about 7000 Greeks.

AD′AM. The name given in the book of Genesis to the first man. The word *Adam* is originally a common noun applied both to a single human being and to mankind in general; hence, as a designation for the first man the Old Testament almost invariably attaches the article to *adam*, which thus becomes *Ha-adam;* that is, "the man." According to the critical school the creation of Adam and Eve has come down to us in two recensions of Genesis, the first. Genesis i : 26-30, forming part of the so-called Elohistic record of creation (see Creation); the second, Genesis ii : 5-24, embodied in the Yahwistic version. According to the former, male and female are created at the same time (Genesis i : 27). The passage is somewhat ambiguous, so that it is not certain whether only a single human pair is referred to or mankind in general, just as according to this version the animal world in general is created at the beginning. In the Yahwistic version, however, a single male individual alone is formed by God, who molds a man out of the "dust of the ground" and breathes into the mass the "breath of life" (Genesis ii : 7). The word used for "ground" is *adamah*, and in the mind of the writer there is evidently a close connection between this word and *Adam*. A common meaning for the Hebrew stem *adam*, from which *adamah* is derived, is "red;" but while this furnishes a satisfactory explanation for the word "ground," it does not follow that the implied biblical etymology for "adam" as man is correct. The stem *adam* occurs in various of the Semitic languages, and exhibits a variety of meanings, such as "pleasant," "to make," "to attach one's self" (hence, to be sociable), and scholarly opinion vacillates between assuming one or the other of these significations as furnishing the explanation of the name "Adam." If any conclusion may be drawn from *ben* or *ibn*, which is the common Semitic word for son and child, and which is derived from a stem signifying "build," the weight of evidence would be in favor of connecting *adam* with "make." In Assyrian we have a word "admu" (the equivalent of the Hebrew Adam), which actually occurs as one of the synonyms of "child" (see Delitzsch, *Assyrisches Wörterbuch*, p. 25). Coming back to the two versions of creation, it will be found that they differ in many respects; but it is by the combination of the two that we obtain the views held by the Hebrews regarding the first man. In the first version, where the work of creation is distributed among six days, humanity is created on the last day. Man is made in the image of God, and given dominion over all the animals, and, indeed, the entire earth. In the second version it is stated that man was placed in a garden situated in Eden (Genesis ii : 8), known as the "Garden of Eden," in which all manner of trees were planted. (See EDEN.) Man is put there to till the ground and to keep guard over it. He is permitted to eat of the fruit of all the trees with the exception of one, known as the "tree of knowledge of good and evil," and which he is not to touch under penalty of death. A woman is created as a helpmate to Adam out of one of his ribs, who is called Eve, a name subsequently explained as "the mother of all living." The close attachment between Adam and Eve (see EVE) is emphasized, and, although not distinctly stated, the narrative implies that she is included in the prohibition not to eat of the one tree singled out. Through the serpent, who assures the woman that she and Adam will not die, the woman is beguiled into eating of the fruit and gives of it to Adam. The first consequence of the act was that the pair recognized their naked state and made loin coverings of fig leaves. Adam pleads in extenuation that the woman gave him of the fruit, and the woman pleads that the serpent beguiled her. All three are punished, the serpent by becoming the cursed one among the animals, the woman by increase of her troubles and pain, particularly in child-bearing, and the man by being obliged henceforth to secure his sustenance by the sweat of his brow in tilling the ground. God makes garments of skin for the pair, and in fear lest they eat also of the "tree of life" which is in the garden, and which is to secure immortality, he drives Adam and Eve out of their first habitation and places cherubim with flaming swords to guard the way to the tree of life.

In the continuation of the narrative (chapter iv : 1-2), the birth of two sons, Cain and Abel, is recounted; but beyond that we learn nothing further of Adam and Eve until we reach a totally different document, a genealogical list in chapter v, in which, after a re-statement of the creation of humanity and the assigning of the name Adam (Genesis v : 2) to *mankind in general*, the birth of Seth, in the 130th year of Adam's life, is recounted, no mention being made of Cain or Abel. Adam is stated to have died at the age of 930 years, after having begotten sons and daughters. In the narrative about Adam thus pieced together from various documents, a further distinction must be made between the story as told in the first three chapters of Genesis and the notes in the fifth chapter. The genealogical list appears to be in reality a list of dynasties, drawn up on the basis of a tradition which belongs to the same category of semi-legendary lore, as the lists preserved by Eusebius and Syncellus of early Babylonian rulers who lived before the flood (see Rogers' *History of Babylonia and Assyria*, i., p. 328); whereas the story of Adam and Eve in the first three chapters of Genesis is a composite production embodying various popular tales of myths, some elements of which revert to tradition held in common at one time by Hebrews and Babylonians, but which, having passed through an independent development among the Hebrews, have been interpreted in the light of the monotheistic conception of the universe, and preserved as an effective means of illustrating the specifically Jewish document of the creation of man and of his fall from divine grace, as an explanation of the toil and ills with which human existence is filled. It is this distinctly theological conception of Adam which becomes uppermost as the religious ideas of the Old Testament become fixed in men's minds. The story of Adam becomes with the growth of Christian theology the most important source for the doctrine of the origin of sin, and over against him is put the second Adam, the first being the fountain of sin, the second the source of salvation. This conception is fully brought out in the teachings of St. Paul (see especially Romans v : 12-21; I. Corinthians xv : 22, and 45-49). In Jewish theology proper the doctrinal development in general is arrested after the separation from Judaism of the new sect made up of the followers of Jesus. The predominant position henceforth occupied in Judaism by obedience to the minute ceremonial prescriptions brings about a concentration of Jewish thought on theoretical discussions of the intricacies of biblical and Talmudical laws, while in place of doctrinal elaboration we have the homiletical interpretation of the narrative in Genesis, which leads to numerous additions to rabbinical literature of the biblical narrative of Adam and of the creation in general, as well as of the stories of the patriarchs in the Book of Genesis. These stories about Adam are collected in the so-called Midrash Rabba to Genesis, a German translation of which was published by Wunsche (*Der Midrasch Rabba zu Genesis*, 1882). From the Jews the stories made their way to the Arabs, and snatches of them are embodied in the Koran. Consult Sale's Translation of the Koran and notes (London, 1877), especially to Suras 15 and 17.

ADAM. In Shakespeare's *As You Like It* (q.v.), an old servant who follows the fortunes of Orlando. His age, he apologetically says, "is as a lusty winter, frosty but kindly" (Act II., Scene 3). The part is one which Shakespeare himself is traditionally said to have played.

ADAM. The name of a distinguished family of British architects of the eighteenth century. WILLIAM ADAM (?-1748) was the author of the library and university of Glasgow and of many public and private buildings at Dundee (town hall) and Edinburgh. His four sons, especially ROBERT (1727-92) and JAMES (?-1794), were prolific and successful architects, and under Robert's leadership did a great deal to remodel London. Robert's studies in Italy and Dalmatia preceded his settling in London, and his book on Diocletian's palace at Spalato increased his reputation, as also did the publication of engravings of the brothers' designs. The Adelphi Terrace and buildings are by Robert, as are also the Register House at Edinburgh, Kedleston Hall, near Derby, Lansdowne House, and many blocks of London houses, to whose interior decoration and arrangement the brothers paid great attention.

ADAM, ȧ'dän', ADOLPHE CHARLES (1803-56). A French composer of operas. He was born and died in Paris. Though originally intended for a scientific career, he entered the conservatory in 1817 and studied composition under Boieldieu, mainly writing transcriptions for the piano. In 1829 his one-act opera, *Pierre et Catherine*, was produced with success, and fifty-two more followed, of which *Le châlet* and *Le postillon de Longjumeau* (1836) are the most famous. The latter, and his *Cantique de Noël*, and, besides, the ballets *Faust* and *Le Corsaire*, are his best known works in the United States. His chief merits are the characteristic French daintiness and finish. He was made professor of composition at the conservatory in 1849. His autobiography and souvenirs were published (Paris, 1860). Consult: A. Pougin, *Adolphe Adam, sa vie, etc.* (Paris, 1876).

ADAM, BOOK OF. See APOCRYPHA and APOCALYPTIC LITERATURE.

ADAM, SIR FREDERICK (1784-1853). An English general. He was educated at Woolwich Military Academy and greatly distinguished himself in the Peninsular campaign. Although severely wounded at the battle of Alicante, he reëntered the service upon his recovery. He repelled the last charge of the French guards at Waterloo.

ADAM, GRAEME MERCER (1839—). A Canadian author and editor. He was born at Loanhead, Midlothian, Scotland. After some experience with the Blackwoods, he emigrated to Toronto, where he became a partner in a successful publishing house. In 1876 he opened, in conjunction with John Lovell of Montreal, a branch house in New York, which has since developed into the John W. Lovell Publishing Company. Returning to Toronto in 1878, he subsequently edited the *Canadian Bookseller;* founded, in conjunction with Goldwin Smith, the *Canadian Monthly* (1872); started the *Canadian Educational Monthly* (1879); and was for several years connected with the *Bystander* as assistant to Goldwin Smith, and contributed extensively to other periodicals. Coming again to New York (1892), he became identified with several publishing houses as "reader," wrote reviews and compiled several books. In 1896 he removed to Chicago to become editor of *Self-Culture.* Among Adam's numerous separate publications are *The Canadian North-West* (1895); *Outline History of Canadian Literature* (1886); topographical and descriptive books of Canada, encyclopædias, and school books. In collaboration with Ethelwyn Wetherald he wrote a successful historical romance entitled *An Algonquin Maiden* (1886).

ADAM, JEAN (1710-65). A Scotch poet. She was born near Greenock. In her earlier life she was a teacher, but, compelled to give up her school, she became a street vendor. She lived a joyless life, and died in the Glasgow poorhouse. She published a volume of religious poems in 1734. By some she is believed to be the author of *There's nae Luck Aboot the House*, a beautiful lyric. (See MICKLE, WILLIAM JULIUS.) Consult *Ward's English Poets* (London, 1880).

ADAM, ȧ'däN', JULIETTE (1836—). A Parisian writer making use of the pseudonyms Juliette Lamber and Comte Paul Vasili. She was born at Verberie, October 4, 1836. Her first book, *Le siège de Paris, journal d'une Parisienne*, is an account of her experiences in 1870-71, when her husband was prefect of police. Her *Nouvelle Revue*, founded in 1879, and her *salon*, have both been politically influential. She has written much for periodicals on politics, literature, education, and the position of women. Her fiction, e.g., *Laïde* (1878), *Grecque* (1879), *Païenne* (1883), is militantly hedonistic, a passionate protest against the anti-natural, or supernatural, in Christianity. She published volumes of reminiscences, as *Le roman de mon enfance et de ma jeunesse* (1902) and *Mes premières armes littéraires et politiques* (1904).

ADAM, LAMBERT SIGISBERT (1700-59). The principal representative of a well-known family of French sculptors. He was born at Nancy, studied under unknown masters at Paris, and won the *Prix de Rome* in 1723. At Rome he modelled his work after Bernini, and quitting the French school in 1730 he executed for Pope Clement XII. a bas-relief, the "Apparition of the Virgin to St. Andrew Corsini," for which he was received into the Academy of St. Luke. In 1733 he returned to Paris. His works include the colossal figures of the Seine and the Marne upon the cascade of St. Cloud; two marble groups, "La Chasse" and "La pêche" at Potsdam (Prussia); and the colossal fountain of Neptune at Versailles (1740), his masterpiece. In this work he was assisted by his brother, Nicholas Sébastien.

ADAM, PAUL (1862—). A French author born in Paris. He participated in the Boulangist movement (1889), and was an unsuccessful candidate for a seat in the Chamber of Deputies. His earliest appearance in literature was made with *Chair molle* (1885). Other stories, chiefly in the manner of the "symbolist" school, are *Robes rouges* (1891), *le Mystère des foules* (2 volumes, 1895), and *la Bataille d'Uhde* (1897). He has also published a cycle of four romances dealing with the period from 1792 to 1830: *La force* (1898), *L'enfant d'Austerlitz* (1902), *La ruse* (1903), and *Au soleil de juillet* (1903). With J. Moréas he wrote *la Thé chez Miranda* (1887). He wrote the dramas *l'Automne* (1893; with G. Mowrey), and *Le cuivre* (1896).

ADAM, QUIRIN FRANÇOIS LUCIEN (1833—). A French magistrate and philologist. He was born at Nancy. Among his numerous works on philology, some of which deal with the languages of the native tribes of America, and the dialects of Lorraine, the following are the

most important: *Grammaire de la langue mandchoue* (1873); *Esquisse d'une grammaire comparée du Crée et du Chippéway* (second edition, 1876); *Etudes sur six langues américaines* (1878); *Les patois lorrains* (1881); *Les idiomes négro-aryens et maléo-aryens* (1883).

AD'AM, TESTAMENT OF. See APOCRYPHA, *Old Testament.*

ADAM, WILLIAM (1751-1839). A British lawyer. He was born in Scotland and in 1774 entered Parliament, where he attached himself to the party of Lord North. Four years afterward he fought a duel with Fox (1778), in which Fox was wounded. He took an important part, however, in effecting the coalition between Fox and North and Shelburne, and was one of the few to maintain his allegiance to his former adversary at the time of the French Revolution. He was one of the managers appointed by the Commons to conduct the impeachment of Warren Hastings (1788). He presided over the Civil Jury Court in Scotland from the time of its establishment (1816) until his death. Consult his *Life*, by G. L. Craik, in the *Dictionary of the Society for the Diffusion of Useful Knowledge.*

AD'AMANT (Gk. ἀ, *a*, priv. + δαμᾶν, *daman*, to tame). The name of any substance of extraordinary hardness. The name was attached to a supposed stone, or mineral, as to the properties of which vague notions long prevailed. It was identified with the lodestone or magnet, and often used as synonymous with it by early writers. This confusion ceased with the seventeenth century, but the word for a long time had currency among scientific writers as a synonym with diamond. The use of the term to denote the lodestone seems to have been due to the early Latin medical writers, who apparently derived the word from the Latin *adamare*, "to have an attraction for."

AD'AMAN'TINE SPAR. See CORUNDUM.

ADAMAWA, ä'dȧ-mä'wȧ, or FUMBINA. One of the subordinate States of the Sokoto Sultanate which constitutes the greater portion of Northern Nigeria (Map: Africa, F 4). Its boundaries are uncertain, but its area is estimated at about 50,000 square miles. The country is elevated in its southern part, where some of the mountains reach an altitude of about 8000 feet. It is traversed by the River Benue and several other streams, and its soil is very fertile. The climate and the flora and the fauna are tropical. Politically, Adamawa is more or less autonomous, and is ruled by a native sultan. The eastern part of Adamawa, as far as the confluence of the Faro with the Benue, is included in the German Kamerun, while the western part, including the capital, Yola, forms a part of northern Nigeria. The principal settlements are Yola, with a population estimated at from 12,000 to 20,000; Banjo, the centre of the ivory trade, and Nganudere. The population of Adamawa is estimated at over three million, but these figures are mere conjecture. The predominant part of the population consists of Fulbe. (See FULAHS.) The first European to visit Adamawa was Dr. Barth in 1851. Consult: Passarge, *Adamaua* (Berlin, 1895).

AD'AM BEDE. The title of a novel by George Eliot (see ELIOT, GEORGE), first published in 1859. The name is that of its principal character, a young English workingman of intellectual tastes and a keen conscience. He is the lover of Hetty Sorrel, but in the end marries Dinah Morris.

AD'AM CU'PID. A name applied to Cupid in Shakespeare's *Romeo and Juliet*, Act II., Scene 1. According to Upton there was an archer named Adam, whose skill was famous in Shakespeare's time, so that the significance of the epithet is evident. Upton cites in confirmation, *Much Ado About Nothing*, Act I., Scene 1: "And he that hits me let him be clapped on the shoulder and called Adam." Other critics maintain that the original was "Abram," a corruption from *Auburn*, since the early folios and quartos give "Abraham" in the passage.

ADAM DE LA HALLE, ȧ'däɴ' de lȧ ȧl'. c.1240-1287?). One of the early founders of the French drama. His *Play of Adam*, or *Le jeu de la feuille*, as it was also called, written for citizens of his native Arras for popular performance, is the earliest French comedy. Adam de la Halle was also a musician, and his *Robin et Marion* is the first European comic opera. His musical compositions, chiefly songs and motets, form a connecting link between the work of the French *déchanteurs* and the Flemish contrapuntists. His works are edited by Coussemaker (Paris, 1872). Consult: Ambros, *Geschichte der Musik*, Volume II. (Breslau, 1862).

AD'AMI, JOHN GEORGE (1862 —). An English pathologist. He was born at Manchester; was educated at Owens College, Manchester, and Christ's College, Cambridge, and studied at Breslau, Paris, and Manchester. He became house physician to the Manchester Royal Infirmary, and demonstrator of pathology at Cambridge in 1887. In 1891 he was elected fellow of Jesus College, Cambridge, and in 1892 professor of pathology at McGill University in Montreal, Canada. He has also been at the head of the pathological department of the Royal Victoria Hospital at Montreal since 1894, and in 1896 became Middleton Goldsmith lecturer to the New York Pathological Society. He has published numerous papers on pathological topics, and articles on inflammation for Allbutt's *System of Medicine.*

AD'AMITES. (1) An obscure and probably non-existent sect mentioned by Epiphanius (*Hær.* 52) as extant in the middle of the fourth century, and so called because they imitated Adamic simplicity in going without clothing while at worship. They are said to have practiced absolute continence. (2) A sect of fanatics founded by a certain Picard, who became numerous in Bohemia and Moravia in the fifteenth and sixteenth centuries, but had no connection with the Hussites. Picard styled himself Adam, the son of God, rejected the sacrament of the supper and the priesthood, and advocated the community of women. After his death his followers increased in Bohemia under several leaders. They even fortified themselves on an island in a tributary of the Moldau and committed various depredations. They were detested as much by the followers of Huss as by the Catholics. Ziska made war against them and slew great numbers, but they were never entirely rooted out. In fact, it is said that in 1849 a similar sect appeared in Austria.

AD'AMNAN, SAINT (625-704). An Irish abbot, properly Adam, of which Adamnan is a diminutive. He was born at Drumhome, southwest Donegal, the extreme northwest county, about the year 625, but entered the monastery of Iona. His father, Ronan, was the great-great-grandson of the uncle of St. Columba, and also claimed kin with many Irish kings. The paternal grandfather was Tinne, from whom came the patronymic *Ua Tinne*, or grandson of Tinne, an appellative which is occasionally found coupled with Adamnan's name. Ronnat, the mother of Adamnan, was descended from Enna, son of Niall, whose race, the Cinel Enna, possessed themselves of the tract lying between the channels of the Foyle and Swilly, which was called the Tir Enna, or Land of Enna, and answers to the modern barony of Raphoe. In the year 697 he was elected abbot of Iona. His rule over that community was not, however, destined to be peaceful and fortunate. The Irish Church then held the Oriental views about dates for observing Easter and the form of the tonsure. In his intercourse with the Saxon Church, Adamnan had adopted the Roman or orthodox views, as they are termed, and endeavored to put them in practice in his own community. He was thwarted in this object, and it is said that mortification at the failure caused his death. He died in Iona, September 23, 704. He left behind him an account of the Holy Land, containing matters which he says were communicated by Arculfus, a French ecclesiastic who had lived in Jerusalem, which is valuable as the earliest information we possess of Palestine in the early ages of Christianity. But far more valuable is his *Vita Sancti Columbæ*, his life of St. Columba, the converter of the Picts, and founder of Iona. Along with miracles and many other stories palpably incredible, this book reveals a great deal of distinct and minute matter concerning the remarkable body to which both the author and his hero belonged. The standard edition of the book is that of William Reeves, D.D., edited in 1857 for the Bannatyne Society of Edinburgh, and the Irish Archæological Society (Dublin, 1857), which, with an English translation, forms the sixth volume of *Historians of Scotland* (Edinburgh, 1874), reissued with additional notes by J. T. Fowler (Oxford, 1895). Nearly all the information to be had about the early Scoto-Irish Church is comprised in that volume.

AD′AM OF BREM′EN. A German historian. He was born, probably, at Meissen, Saxony (the date uncertain), and came to Bremen in 1067 from Magdeburg, and became a canon of the cathedral, and in 1068 principal of the cathedral school. He won perpetual fame by writing (between 1072 and 1076) from all available sources, including the oral testimony of Svend Estridson, King of Denmark, to see whom he made a special journey, a history of the Hamburg Church, which is one of the most precious of mediæval histories. The best edition of this great work, *Gesta Hammaburgensis Ecclesiæ Pontificum*, is by Lappenberg (Hanover, 1876). The third edition of the German translation, by J. C. M. Laurent, appeared in the series *Die Geschichtschreiber der Deutschen Vorzeit* (Berlin, 1893). As the appendix to the third and last book Adam gives a general account of the lands belonging to the Danes and Swedes, and of Norway. In it occurs this interesting passage referring to America: "Besides this he (Svend Estridson, King of Denmark) told of still another island that had been found by many in that ocean (the Atlantic). It is called Wineland, because vines spring up there spontaneously, producing excellent wine. I mention this confidently, for I have learned from no fabulous rumor, but through definite information from Danes, that crops also grow there in abundance without having been sown." (Cap. 247, or § 38). In his book Adam quotes from preceding chroniclers, from Cicero, from the Latin poets, Vergil, Horace, Lucan, Juvenal, and Persius; from the Latin Fathers, Jerome, Ambrose, Gregory the Great; from Bede, Cassiodorus, and Paulus Diaconus. But the style is defective and the Latin difficult and faulty, notwithstanding that he took Sallust as his master. Although the day of his death, October 12, is known from the church record of Bremen, the year is not, but probably it was about 1076.

ADAM OF ST. VIC′TOR (?-c.1192). A monastic poet of France. Nothing is known of him except that he died in the abbey of St. Victor in Paris. Yet he was "the most prominent and prolific of the Latin hymnists of the Middle Ages." His works—complete as far as discovered, but doubtless far from being really so—were edited by Léon Gautier (third edition, Paris, 1894; English translation, London, 1881, 3 volumes). Consult: Julian, *Dictionary of Hymnology* (1888); French, *Sacred Latin Poetry* (1874); and Duffield, *Latin Hymns* (1888).

AD′AMS. A town, including the villages of Renfrew, Maple Grove, and Zylonite, in Berkshire Co., Mass., 16 miles north of Pittsfield, on the Pittsfield and North Adams branch of the Boston and Albany Railroad and on the Hoosac River (Map: Massachusetts, A 2). Within the town limits is Greylock Mountain (3535 feet), the highest point in Massachusetts. The town has a public library of over 12,000 volumes, and manufactures cotton and woolen goods, paper, foundry products, shirts, etc. Laid out and settled as "East Hoosuck" in 1749, Adams was incorporated under its present name (in honor of Samuel Adams) in 1778. It originally included both North and South Adams. The government is administered by town meeting. Pop., 1890, 9213; 1900, 11,134; 1905, 12,486. Consult: J. G. Holland, *History of Western Massachusetts* (Springfield, 1855).

ADAMS, Abigail Smith (1744-1818). The wife of John Adams, second President of the United States, and daughter of Rev. William Smith, minister of the Congregational church at Weymouth, Mass. She was born at Weymouth, Mass., and died at Quincy, Mass. Through her mother, Elizabeth Quincy, she was descended from the Puritan preacher, Thomas Shepard of Cambridge, and though of defective education, delicate health, and nervous temperament, she was one of the most influential women of her day, and one of its most vigorous and elegant stylists, owing little to teaching but much to influence and environment. During and after the Revolutionary War, she was at times separated from her husband, who was a delegate to Congress and who afterward engaged in diplomatic business in Europe. Joining him in France in 1784, she accompanied him to London, where she had unpleasant social experiences. From 1789 to 1801 she lived at Washington, then till her death at Braintree, in what is now Quincy. *The Familiar Letters of John Adams and His Wife*, published with a memoir by C. F. Adams (1876), show her to have been a woman of keenness, sagacity, and geniality, and throw very valuable light on the history and social life of her time.

ADAMS, Alvin (1804-77). The founder of Adams Express Company of America. He was born at Andover, Vt., and in 1840 established between New York and Boston an express route which, subsequently extended, led in 1854 to the incorporation of the Adams Express Company. Consult: Stimson, *History of the Express Business* (New York, 1881).

ADAMS, Brooks (1848 —). An American lawyer and social essayist. He was born at Quincy, Mass., a son of Charles Francis Adams (q.v.). He was educated in Quincy, in Washington, and in Europe, according to the changes of his father's residence. He graduated at Harvard in 1870, was admitted to the bar, and practised law till 1881. His writings include many magazine articles, and the following books: *The Gold Standard, The Emancipation of Massachusetts* (1887), a study in the evolution of religious freedom; an historical essay, *The Law of Civilization and Decay*, and *America's Economic Supremacy* (1900), and *The New Empire* (1902).

ADAMS, Charles Baker (1814-53). An American naturalist. He was born at Dorchester, Mass. He graduated at Amherst; assisted Prof. Edward Hitchcock in the geological survey of New York; became tutor at Amherst, 1836; professor of chemistry and natural history in Middlebury College, Vermont, 1838 to 1847, and was professor of astronomy and zoölogy at Amherst from 1847 till his death. From 1845 to 1847 he was State geologist of Vermont. He went several times to the West Indies in the interest of science; wrote on conchology, and with the assistance of Prof. Alonzo Gray, of Brooklyn, published an elementary work on geology.

ADAMS, Charles Follen (1842—). A humorous dialect poet. He was born at Dorchester, Mass., and was educated in the common schools. He served in the Civil War, and was wounded and captured at Gettysburg. In 1872 he began poetic production, cultivating the ballad in German dialect. His verses are collected under the titles *Leedle Yawcob Strauss and Other Poems* (1878), and *Dialect Ballads* (1887).

ADAMS, Charles Francis (1807-86). An American diplomat and statesman, the son of President J. Q. Adams. He was born in Boston; spent the years 1809 to 1817 with his father in Europe, chiefly in Russia and England; prepared for college at the Boston Latin School, and graduated at Harvard in 1825. He then spent several years in Washington, and later studied law in the office of Daniel Webster (at Boston) from November, 1828, to January, 1829, when he was admitted to the bar, though he never practiced. During the next ten years he devoted himself chiefly to literary pursuits, contributing many papers to magazines, writing an able political pamphlet entitled, *An Appeal from the New to the Old Whigs* (Boston, 1835), and editing the *Letters of Abigail and John Adams* (1840-41). From 1841 to 1846 he was a member of the State Legislature, serving three years in the House and two in the Senate; and from 1846 to 1848 he was editor of the *Boston Whig*, and as such was the leader of that wing of his party called the "Conscience Whigs." In 1848 he presided over the Free Soil Convention at Buffalo, and was unanimously nominated for vice-president, but after the election retired to Quincy, Mass., and spent several years in editing the *Works of John Adams* (10 volumes, 1850-56). In 1858 he was elected to Congress as a Republican, and served with marked ability until May, 1861, when he was sent as United States Minister to England. Here he remained for seven years, and during the Civil War rendered invaluable services to his government. In face of the pronounced sympathy for the South manifested by the aristocracy and the upper social classes generally and of the favoritism at times of the British government itself, he preserved throughout a dignified demeanor and performed his duties with such ability as to earn for himself a place second only to that of Franklin in the history of American diplomacy. Indeed, many years later Lowell said: "None of our generals in the field, not Grant himself, did us better or more trying service than he in his forlorn outpost in London." He returned to America in 1868, and was elected to the presidency of Harvard in the following year, but declined to serve. In 1872 he barely failed of a nomination to the presidency at the hands of the Liberal Republicans. He was the arbitrator for the United States at Geneva in 1871 and 1872 (see Alabama Claims), and to him is due in great part the credit for the successful settlement of all difficulties with England growing out of the controversy of the Civil War. On his return he was engaged for several years in editing the *Diary of John Quincy Adams* (12 volumes, 1874-77). Both in politics and diplomacy Mr. Adams was austere, dignified, eminently sincere, and independent to a fault. As an authoritative biography consult C. F. Adams, Jr., *Life of Charles Francis Adams* (Boston, 1900), in the American Statesmen Series.

ADAMS, Charles Francis, Jr. (1835—). An American soldier, financier, and writer. He is a son of Charles Francis Adams, and was born in Boston, Mass., May 27, 1835. He graduated at Harvard in 1856, studied law in the office of Richard Henry Dana, Jr., and was admitted to the bar in 1858. He entered the Union Army as first lieutenant in a Massachusetts cavalry regiment in 1861, became a captain in 1862, served as chief of squadron at Gettysburg, and at the close of the war was in command, as colonel, of a regiment of colored cavalry. In May, 1865, he was brevetted brigadier-general in the regular army, and in July retired from active service. From 1884 to 1890 he was president of the Union Pacific Railroad Company. From 1893 to 1895 he was chairman of the Massachusetts Park Commission, and as such took a prominent part in planning the present park system of the State. Since about 1874 he has devoted much of his time to the study of American history, and in recognition of his work in this field was chosen president of the Massachusetts Historical Society in 1895, and of the American Historical Association in 1901. His writings and addresses both on problems of railway management and on historical subjects are marked by a singular clarity of statement and a degree of intellectual independence that has frequently given rise to widespread controversy. He has written: *Railroads, Their Origin and Problems* (New York, 1878); *Notes on Railway*

Accidents (New York, 1879); *Richard Henry Dana: A Biography* (Boston, 1891); *Three Episodes of Massachusetts History* (Boston, 1892), a work which gives an account of the settlement of Boston Bay, of the Antinómian controversy, and of church and town government in early Massachusetts; *Massachusetts: Its Historians and Its History* (Boston, 1893), an excellent *Life of Charles Francis Adams* (Boston, 1900), in the American Statesmen Series, and *Lee at Appomattox, and Other Papers* (1902). With his brother, Henry Adams, he wrote *Chapters of Erie, and Other Essays* (New York, 1871).

ADAMS, Charles Kendall, LL.D., J.U.D. (1835-1902). An American educator and historian; born in Derby, Vt.; graduated at the University of Michigan, in 1861, where he was assistant professor of Latin and history from 1863 to 1867, and full professor of history from 1867 to 1885. Having studied abroad in 1867 and 1868, he established (1869-70) an historical seminary which proved of great value in promoting the study of history and political science. In 1881 he was made non-resident professor of history at Cornell, and in 1885 succeeded Andrew D. White as president of that university. From 1892 until 1902 he was president of the University of Wisconsin. In 1890 he was president of the American Historical Association. He was editor-in-chief of Johnson's *Universal Cyclopædia* (now the *Universal Cyclopædia*) from 1892 to 1895. Among his publications are *Democracy and Monarchy in France* (1872); *British Orations* (1884), and *Christopher Columbus, His Life and Work* (1892).

ADAMS, Charles R. (1848-1900). An American dramatic tenor. He was born at Charlestown, Mass. He studied in Vienna, and sang for three years at the Royal Opera, Berlin, and for nine years at the Imperial Opera, Vienna. His reputation, especially as a Wagnerian singer, was earned chiefly abroad. In 1879 he took up his residence in Boston, where he was highly esteemed as a teacher.

ADAMS, Edwin (1834-77). An American actor. He was born in Massachusetts, and first appeared at the Boston National Theatre, August 29, 1853, as Stephen in *The Hunchback.* He played Hamlet with Kate Bateman and J. W. Wallack at the New York Winter Garden in 1860, and then starred in all the principal cities; reappeared in New York in 1866, as Robert Landry in *The Dead Heart;* was in the company when Booth's Theatre opened, February 3, 1867, and played Mercutio, Iago, and Enoch Arden in that house. It was in the latter character that he attracted the most attention.

ADAMS, Frederick W. (1787-1859). An American physician and violin-maker. He was born at Pawlet, Vt., studied at Dartmouth College, and practised with much success as a physician. He made a number of excellent violins of wood selected by himself from the forests of Vermont and Canada. He published *Theological Criticism* (1843).

ADAMS, George Burton (1851—). An American historian, born at Fairfield, Vt., and educated at Beloit College (1873), at the Yale Divinity School, and at the University of Leipzig. He became professor of history at Yale in 1888. His original works include: *Primer of Mediæval Civilization* (1883); *Civilization During the Middle Ages* (1894); *The Growth of the French Nation* (1896); *European History* (1899), and vol. ii. in Hunt and Poole's *Political History of England* (1905).

ADAMS, Hannah (1755-1832). One of the earliest American women writers. She was the author of *Views of Religious Opinions* (1784); *History of New England* (1799); *Evidences of Christianity* (1801) and a *History of the Jews* (1812), all of which brought fame, but little money. Her home was in Brookline, Mass.

ADAMS, Henry (1838—). An American historian, third son of Charles Francis Adams (q.v.). He was born in Boston and graduated at Harvard in 1858. He was private secretary to his father when the latter was Minister to England, assistant professor of history at Harvard from 1870 to 1877, and editor of the *North American Review* in 1875 and 1876. One of the fruits of his original methods of instruction was a volume of *Essays on Anglo-Saxon Law* (1876), of which he wrote the first, on *Anglo-Saxon Courts of Law.* The others were by H. C. Lodge, E. Young, and J. L. McLaughlin. He subsequently made his home in Washington, and devoted himself to a study of the administrations of Jefferson and Madison, the results of which appeared in nine volumes as a *History of the United States from 1801 to 1817* (1889-90), a work of original research. He previously edited the writings of Albert Gallatin (3 volumes, 1879), and wrote a life of John Randolph (1882; second edition, 1898) for the American Statesmen Series.

ADAMS, Henry Carter (1852—). An American economist. He was born in Davenport, Ia., and was educated at Iowa College and Johns Hopkins University. He was statistician to the Interstate Commerce Commission and special agent of the eleventh census, in charge of the department of transportation, and is professor of political economy and finance at the University of Michigan. His publications, besides reports, include: *Taxation in the United States, 1789-1816* (1884); *Public Debts* (1887); *Relation of the States to Industrial Action* (1887); *Relation of American Municipalities to Quasi-Public Works* (1888).

ADAMS, Herbert Baxter (1850-1901). An American educator and historian. He was born at Amherst, Mass., and educated at Amherst College. He took his doctor's degree at Heidelberg and then became connected with the Johns Hopkins University at its inception in 1876. He was made associate professor of history in 1883 and professor in 1891. Owing to ill health, he resigned in 1901. He edited the valuable *Johns Hopkins Studies in History and Political Science* from the beginning, and an important series of monographs on American educational history published by the United States Bureau of Education. Besides many monographs, he wrote *The Life and Writings of Jared Sparks* (2 volumes, 1893). Dr. Adams's influence upon historical studies in America, especially through the numerous pupils whom he trained, was very beneficial. He took great interest in university extension, and in the work of the American Historical Association, of which he was secretary from its founding in 1884 until 1900, when he resigned and was made first vice-president.

ADAMS, Herbert. American sculptor (1858—). Among his important works are a portrait bust of his future wife (1887), and sculptures in the Emmanuel Church at Brooklyn, the Auburn Theological Seminary, and the Congressional Library. More recent are the statue of William Elliott Channing in Boston, 1902, and the bronze doors of St. Bartholomew's, New York. Some of his chief works were exhibited at St. Louis in 1903. Consult: Taft, *History of American Sculpture* (New York, 1904).

ADAMS, John (1735-1826). The second President of the United States. He was born at Quincy, Mass., October 30, 1735, of a family descended from Henry Adams, a Puritan emigrant who settled in Massachusetts about 1640. He graduated from Harvard in 1755, and, after an interval of teaching, studied law, and was admitted to the bar in 1758. In 1764 he married Abigail Smith, daughter of the minister at Weymouth, a woman who herself became conspicuous, and whose influence and assistance were important factors throughout the entire career of her husband. (See Adams, Abigail.) Soon after he went into politics, and, although not a resident of Boston, was selected to act as counsel with Gridley and Otis in presenting to the governor a memorial against the Stamp Act (q.v.). Adams then took the bold stand that the act was void because Parliament had no right to tax the colonists, and that such statutes could have no possible force over persons who had not consented to the passage thereof. In 1768 he moved to Boston, and soon after was offered, and declined, the position of advocate-general in the Court of Admiralty, an office which would have greatly increased his professional opportunities, though it would have placed him under embarrassing obligations to the Royalist politicians. Two years afterward he was able, without prejudicing himself among the patriot party, to render the unique service of defending Captain Preston in the Boston Massacre case and securing his acquittal. He had already written on taxation for the *Boston Gazette*, and he again published articles at the time of the controversy over the independence of the judiciary, collaborated in the authorship of the reply to Hutchinson in 1773, and later produced the "Novanglus" articles in reply to the Tory, Leonard. He was closely associated with Samuel Adams in the political leadership of Massachusetts, especially in the legislative crisis of June, 1774, and then was chosen by the House of Representatives as one of their five delegates to the Continental Congress. In that body his energy was devoted to the adoption of a comprehensive programme having three distinct elements—the organization of commonwealth governments on an independent basis, the formation of a national confederate government, and the establishment of diplomatic relations with foreign powers. The first victory was gained when the Congress passed the resolutions of May 10 and 15, 1776, recommending to all colonies the formation of State governments on a basis such as to serve them if permanently independent. This made natural, if not inevitable, the formal Declaration of Independence (q.v.), the original motion for which was seconded by Adams, who now was placed on the committee which drafted that document.

For three years he was a most arduous worker in advancing the plans of Congress and in perfecting the details of the new national government, serving on numberless committees, and being placed at the head of several important ones at a time when the congressional committees were the heads of the undeveloped executive departments. Especially in the War Department, and to a considerable extent in the Navy Department, was his influence great and his work attended with quite permanent results, while his membership of the committee on foreign relations enabled him to become equipped for the service by which later he attained distinction. In 1778 he was sent to France to supersede Silas Deane; but his stay was brief, the treaty between that country and the United States having been concluded just before his departure from Boston. During his attendance upon the Continental Congress he continued to be an active counselor of the leaders in Massachusetts, although he declined the office of chief justice of the State. He was an active member of the committee of three which drafted the first constitution of Massachusetts. To that work he came almost directly from his first mission to France, and from it he proceeded at once to undertake his further duties of securing from Holland support for the national finances, and of negotiating, with the other commissioners, terms of peace with England.

His success in effecting a loan in Holland was preceded by several months of difficult diplomacy, the result of which was that in April, 1782, the Dutch Government formally recognized Adams as the minister of an independent nation. Stimulated by this notable accomplishment and by the realization that upon his exertions depended the New Englanders' rights in the Newfoundland fisheries, Adams entered upon the negotiations at Paris with a spirit of independence and of determination which, although seeming to occasion rather than to allay embarrassments, contributed much to the successful issue.

The post of minister to Great Britain was next occupied by Adams, but the relations between the countries were still such as to make the life irksome to one of Adams's temperament, especially as his desire to be recalled was strengthened by his belief that the service he was rendering was bringing no particular benefit to his country. Accordingly, in the spring of 1788, he returned, having already shown in detail his views on American affairs in his elaborate *Defence of the Constitution of the United States* (3 volumes, London, 1787). He was elected vice-president at the first election under the new constitution and served for two terms, exercising, in the formative years of political parties and in the time of nearly equal division of the Senate between them, a power seldom possessed by a vice-president. Where matters of foreign policy raised the questions at issue, Adams sympathized with England, and thus was thrown into opposition to the friends of France, led by Jefferson. In matters of internal policy, also, he supported the programme of Hamilton, and where party lines were finally drawn he was recognized as one of the leaders of the Federalists. By them he was advanced to the presidency at the same time that, under the system then prevailing, the leader of the opposing party became vice-president. Jefferson's success in 1800, was made possible, however, largely by the developments of Federalist policy and of factional controversy within the party. Upon Adams's accession to office, relations with France had been complicated by the Directory's refusal to receive Pinckney, and when finally the joint mission of Pinckney, Marshall, and Gerry met with highly questionable treatment, the prospect seemed dubious. (See X Y Z Correspondence.) War seemed imminent, and indeed there were hostile encounters on the water. Preparations for the struggle were coupled with the effort to repress the violent opposition to the policy of the administration through the harsh means of the Alien and Sedition Acts (q.v.).

War having been averted, it was at once recognized that the Federalists in these statutes had gone too far in restraining the rights of the individual and in encroaching upon the jurisdiction of the States. Certain it was that in his thoroughness Adams had given his opponents a very welcome and a very powerful means of attack, of which they promptly and vigorously took advantage, and at once began, by such steps as the Virginia and Kentucky resolutions (q.v.), the campaign which finally established the party of the opposite doctrine. This establishment was made easy also by the internal weakening of the Federalist party in the bitter fight for leadership between Adams and Hamilton. The retirement of Adams thus occurred amid the hostility of his enemies and the hatred of those who were his party associates. Nor was it possible to expect any relief from the painfulness of such a situation when the defeated one possessed a manner and a temperament such as were Adams's. Consequently, aside from intermittent criticism and counter criticism, and aside from service in the Massachusetts Constitutional Convention of 1820, this retirement continued unbroken. He died July 4, 1826, on the same day as Jefferson. President John Quincy Adams was his son.

Consult: His *Works*, with a biography, edited by C. F. Adams, 10 volumes (Boston, 1850-56); also his biography, J. T. Morse (Boston, 1884); *The Letters of Abigail and John Adams* (Boston, 1840-41), and *Familiar Letters of John Adams to His Wife During the Revolution; With a Memoir of Mrs. Adams*, edited by C. F. Adams (New York, 1876), and Chamberlain, *John Adams* (1898).

ADAMS, John (1760-1829). The assumed name of Alexander Smith, one of the mutineers of the English ship *Bounty*. With eight sailors and some men and women from Tahiti he landed on Pitcairn Island and formed a government, of which he was the head. In 1800 he was the only surviving Englishman. He established worship and such a school as was possible. In 1808, Captain Folger, an American, landed there and brought the world the first news of this strange settlement. Adams had not heard a word from civilized countries for twenty years. England never sought to punish him, and he died in peace, leaving a prosperous and religious people. See Pitcairn Island.

ADAMS, John (1772-1863). An American teacher. He was born in Connecticut, graduated at Yale, 1795, and after teaching for fifteen years in secondary schools in New Jersey and his native State, became principal of Phillips Academy, Andover, Mass. That place he filled for twenty-three years, resigning in 1833. Beside having built up one of the historic schools of New England, Dr. Adams is remembered as the schoolmaster of Oliver Wendell Holmes, and the subject of the lines:

> "Uneasy lie the heads of all that rule—
> His most of all whose kingdom is a school."

Consult: M. E. B. and H. G. B., *The Story of John Adams, a New England Schoolmaster* (1900).

ADAMS, John Couch (1819-92). An English astronomer. He was born near Launceston, in Cornwall, and early manifested an aptitude for mathematics. After the usual amount of school training he was sent to St. John's College, Cambridge, where he attained the honor of senior wrangler, and became a mathematical tutor. In 1843 he attempted to ascertain by mathematical calculation whether certain observed irregularities in the motion of Uranus could be explained on the hypothesis of perturbation (q.v.) exercised by an exterior planet. The problem at issue was the inverse of the usual perturbation problem. Instead of computing the effect brought about by a planet of known mass pursuing a known orbit, it was required to determine the unknown cause of a known effect. By 1845 Adams had solved this new problem, and was able to assign to the hypothetical planet, the now well known Neptune, a position differing less than two degrees from its actual place in the sky. But a careful telescopic search was at the time postponed or neglected, so that the honor of the great discovery completing Adams's mathematical researches by an observational verification was lost to Great Britain. Leverrier, of Paris, had been making an independent investigation, and by August 31, 1846, he too had determined Neptune's place in the sky. He wrote to Galle at Berlin, and the latter found the planet on September 23 of the same year. This mathematical discovery of Neptune is justly counted among the greatest triumphs of science.

ADAMS, John Quincy (1767-1848). The sixth President of the United States and son of the second President, John Adams. He was born in Quincy, Mass., July 11, 1767. In 1778 he was taken abroad by his father when the latter visited Paris on a diplomatic mission, and only three years later, after studying for brief periods at Paris, Leyden, and Amsterdam, the youth was appointed private secretary to Francis Dana, the American minister to Russia. After some service at St. Petersburg, Adams again joined his father, then negotiating the final peace at Paris; but when, after the conclusion of that important work, the elder Adams was rewarded with the English mission, the younger Adams adopted the significant and even remarkable course of returning home and entering Harvard College.

Upon his graduation there in 1787 he began the study of law with Theophilus Parsons (q.v.), and was admitted to the bar in 1790. He contributed to the political literature of the time, discussing the theories of Tom Paine, and especially the Genet incident (see Genet, E. C.), and our relations with France. His unusual opportunities and training were readily recognized, and in 1794 Washington sent him as minister to The Hague. Later he was appointed to the Portuguese mission, but before he had entered upon the duties of that office his father had become President, and the son, upon the recommendation of Washington himself, was transferred to the more responsible post of minister to Prussia. His father recalled him in 1801, in order that his successor in the presidency might be under no embarrassment. In the year following his return Adams was sent to the State Senate, and in 1803 the Massachusetts legislature sent him to the United States Senate in preference to Timothy Pickering (q.v.).

While in the Senate he gave his support to the purchase of Louisiana (q.v.), although he disagreed with the administration upon some of the ensuing problems, and also approved the policy of the embargo and the non-importation acts. The result was that the former Federalist and the representative of a strongly Federalist State became a hearty advocate of the Republican administration, and in consequence the attitude of his constituents became so critical that in 1808 Adams resigned his seat. He was, however, so identified with the party in power that in 1809 President Madison appointed him Minister to Russia. While there he was named as one of the commissioners who were to act in connection with the mediation proposed by Russia, but which was made impossible by the declination of England. He was soon appointed, however, one of the five negotiators who concluded the Treaty of Ghent (q.v.) at the close of the War of 1812.

From that work Adams proceeded to London, where he served as Minister to England until his varied and remarkable diplomatic career was ended in 1817 by his appointment by President Monroe to the post of Secretary of State. His work as secretary was concerned with the difficult negotiations which in 1819 ended in the purchase of Florida, the more delicate relations with England with reference to the fisheries convention of 1818 and the conflicting claims in the Columbia River basin, and the more far-reaching steps taken to counteract the encroachments of the Holy Alliance, in connection with which was announced the Monroe Doctrine (q.v.), so that some credited the latter to Adams. As a member of the cabinet, aside from matters of diplomacy, he took a unique position in upholding General Jackson for his conduct in the Florida War, and in rendering a highly valuable service to his later antagonist.

By virtue of his position, the friends of Adams expected that in 1824 he would be advanced in the same manner as Madison and Monroe, who had each in turn passed from the state department to the presidency. The nominations, however, were still made by the congressional caucus, which at this time was controlled by Crawford. Moreover, the newly formed trans-Alleghany States were pressing their claims for recognition, so that the revolt against the old nominating system and the crystallizing of the various factions within the one great party alone remaining active led to the candidacy of four Republicans in 1824. Of these, Jackson received 99 electoral votes, Adams 84, Crawford 41, and Clay 37. When the vote, according to the Constitution, was thus given to the House of Representatives, choosing from among the three highest, the Clay interests joined with those of Adams and effected the defeat of Jackson. Adams, upon his accession, made Clay his Secretary of State, and not only brought upon himself charges of corruption, but also secured the vigorous enmity of the rapidly increasing Jackson wing of the Republican party. To offset this, Adams was not qualified to exert the influence usually attaching to a political leader, nor was he able so to make use of his office as to build up an Adams faction that could hope to wage a successful warfare with the embittered Jacksonians. It was natural, therefore, that after four troublous and not particularly profitable years, Adams should be overwhelmed in the election of 1828. Instead of going into retirement, he adopted the unprecedented course of returning to Washington as a member of the House of Representatives, and in that capacity rendered still further and conspicuous service to the nation from 1830 until his death. Being practically above party restraints, he was free to do a work which made notable the later years of "the old man eloquent." The slavery issue appeared in Congress in two forms, involving the question of the right of the government or of its officials to exclude abolitionist literature from the mails, and involving the question whether petitioners to the House of Representatives might demand that their petitions should be read, even if not considered. The former problem provoked a long and severe dispute, while the second controversy was made acute by the introduction of the "Gag Rules" (q.v.), which, Adams contended, substantially destroyed the right of petition, and against which he labored vigorously, and in the end successfully. Late in 1846 he was stricken with paralysis, and early in 1848 he was again stricken, while in his seat in the House, and died two days later, on February 23, 1848.

Adams followed the example of his father in keeping an extensive diary, which is included in his *Memoirs*, edited by C. F. Adams (12 volumes, Philadelphia, 1874-77). For his biography consult: W. H. Seward, *Life of Adams* (Auburn, 1849), and Quincy, *Memoir* (Boston, 1858); or, for the most recent work, Morse, *John Quincy Adams* (Boston, 1882).

ADAMS, JOHN QUINCY, 2d (1833-94). An American politician. He was born in Boston, the grandson of President J. Q. Adams and son of Charles Francis Adams. He graduated at Harvard, 1853, and became a lawyer. He served three terms in the Massachusetts Legislature, and was an unsuccessful candidate for governor on the Democratic ticket in 1867 and 1871. In 1872 he was nominated for the vice-presidency on the ticket with Charles O'Conor by those Democrats who would not support Horace Greeley.

ADAMS, JULIUS WALKER (1812-99). An American civil engineer. He was born at Boston, Mass., studied for two years at the United States Military Academy, and from 1833 to 1869 was connected as engineer with various railways and public works. From 1869 to 1878 he was chief engineer of the Brooklyn board of city works, and from 1878 to 1889 consulting engineer of the board of public works of New York City. A suggestion of his led to the formation of a company which eventually had charge of building the first bridge over the East River at New York. During the Civil War he for a time commanded the First Long Island Volunteers, and during the New York draft riots of 1863 commanded the troops at Printing House Square.

ADAMS, MAUDE KISKADDEN (1872—). A popular American actress. She was born at Salt Lake City, November 11, 1872, and is the daughter of an actress. She first appeared on the stage in the West, in children's parts, when very young. At sixteen she joined E. H. Sothern's company in New York, and played in *The Midnight Bell*. Afterward she was a member of Charles Frohman's stock company. With John Drew in *The Masked Ball* (1892) she made an extraordinary advance in public favor. She became a star as Lady Babbie in *The Little Minister*, produced in New York (1898), where in 1899 she played Juliet to the Romeo of William Faversham. In 1900 and 1901 she won another popular success as the Duc de Reichstadt in Rostand's *L'Aiglon*, and the next season she played Miss Phœbe in Barrie's *Quality Street*. She played in Mrs. Burnett's *Little Sister of San José* (1905), and in 1906 was successful in Barrie's *Peter Pan*. Consult: Clapp and Edgett, *Players of the Present*, in Dunlap Society Publications (New York, 1899).

ADAMS, Nehemiah (1806-78). An American Congregational clergyman. He was born in Salem, Mass., graduated at Harvard in 1826, and three years later at Andover Theological Seminary. He then became pastor in Cambridge, Mass., and from 1834 was pastor of the Essex Street Church, Boston. After a winter spent in Georgia for his health, he published *A South Side View of Slavery* (1854). His praise of the effect of slavery on the religious character of the negroes provoked much hostile criticism. He published several controversial works and a *Life of John Eliot*.

ADAMS, Oscar Fay. (1855 —). An American editor and author. He was born at Worcester, Mass., was educated in secondary schools, taught classes in English literature, and since 1880 has written much for periodicals. He has edited *Through the Year With the Poets* (12 volumes, 1886), and published *The Story of Jane Austen's Life* (1891; second edition, 1896), *The Archbishop's Unguarded Moment, and Other Stories* (1899), a *Dictionary of American Authors* (revised edition, 1901), and several other compilations.

ADAMS, Parson Abraham. A leading character in Fielding's novel, *Joseph Andrews*. He is a country curate, a very learned scholar, skilled in dead and living languages but excessively simple-minded and unfamiliar with the ways of the world. In spite of his poverty, his generosity and native dignity command respect; his oddities, however, and his absence of mind bring him into many quaint adventures.

ADAMS, Samuel (1722-1803). One of the leading men in the promotion of the American Revolution. He was born in Boston, Mass., September 27, 1722, of an aristocratic family, and, like John Adams, the second President of the United States, was descended from Henry Adams, a Puritan emigrant. He fitted for college at the Boston Latin School, and entered Harvard in 1736. On leaving college in 1740, he entered a law office; but the law proving distasteful, he next entered a counting-house, and soon became a merchant himself, but failed. Subsequently he became a partner with his father in a brewery, and failed after the latter's death. As a business man, he seems throughout to have been a complete failure; and the burden thus thrown on the other members of the family was increased later by the complete absorption with which he devoted his time and energy exclusively to political affairs and public service. When a candidate for the degree of A.M. at Harvard College, he had maintained in his thesis the affirmative of the question: Whether it be lawful to resist the supreme magistrate, if the commonwealth cannot be otherwise preserved.

He was early engaged in the activities of town politics in Boston; and the overthrow of the Land Bank, with the incidental destruction of his father's estate, brought him into contact with provincial affairs and decisively influenced his general attitude toward the home government. His formal entry into politics was in his election as a tax collector of Boston in 1763, an office which he held for two years. His careless, or at all events unsuccessful, performance of the duties of that office soon afforded his opponents the basis for a vigorous though ineffectual attack, but both his personal integrity and political uprightness remained above suspicion. By him were drafted the important instructions given by the town of Boston to its representatives in the assembly in 1764, and in these was put forth one of the earliest protests against the ministerial plan of colonial taxation.

Likewise in 1765 Adams drafted the Boston instructions to representatives, and in the same year he himself was sent to the Legislature. Being elected clerk of the House in 1766, and also serving on many committees, it was natural that he should be the author of many of the most important State documents of the pre-revolutionary period. Instructions to the political agent in London, addresses to the governor, appeals to the ministry, and proposals or exhortations addressed to fellow colonists, in great number issued from the Massachusetts House of Representatives, and in many instances came from the pen of Adams. Thus the very influential circular letter of February, 1768, as well as the *True Sentiments of America*, issued in the same year, and the widely read *Appeal to the World* of 1769, have been traced to the authorship of Adams. Later, in 1772, he prepared for the town of Boston the very telling pamphlet on *The Rights of the Colonists as Men, as Christians, and as Subjects*. Very important as were all these contributions to the movement toward revolution, the most effective literary work of Adams was, undoubtedly, the great number of newspaper articles, under various pseudonyms, in the patriotic *Boston Gazette*. In these he made plain the cause of the colonists, exposed the impracticability of any reconciliation, converted the hesitating and inspired the Radicals, and exerted a very far-reaching influence in preparing the popular mind for revolution and in hastening the approach of the crisis. In practical politics as well, he was recognized as a leader not only in Massachusetts but in the other colonies. He bore the burden of the long series of controversies with the governors of Massachusetts over the presence of troops, the salaries of judges, and the place of meeting of the legislature; and at the time of the Boston Massacre of March, 1770, headed the committee which demanded from Hutchinson the immediate withdrawal of the troops. He was conspicuous in planning the local "committees of correspondence;" and when finally, in June, 1774, the Massachusetts legislature bade defiance to Gage and issued the call for the Continental Congress, it was Adams who directed the movement.

He was naturally sent to the Continental Congress, and when that body finally declared for independence, it may be said that the real life work of Adams had been completed. He had been the ideal representative of the town-meeting system, the extreme defender of the "natural" rights of man, and the irrepressible advocate of independence. His work during the Revolution was less noteworthy, and was at times open to criticism. Thus, he was one of the strongest supporters of the committee system of national administration, and one of those who delayed unnecessarily and unfortunately the organization of executive departments under single heads. In the politics of his native State he always took an active and effective interest. He was one of the committee which prepared the present constitution of the State, the only constitution of the revolutionary period still in force. He served on the executive council of the State, was for several years lieutenant-governor, and three times was elected governor. He was considered an opponent of the federal constitution in 1788, but on his finally giving his voice in favor of adoption, with the proposal of amendments, its ratification was assured. He died in Boston, October 2, 1803. For his biography consult: W. V. Wells (3 volumes, Boston, 1865); J. K. Hosmer (Boston, 1885).

ADAMS, Sarah Fuller Flower (1805-48). An English poetess. She was born at Great Harlow, Essex, and married William Bridges Adams in 1834. Her longest work is *Vivia Perpetua, A Dramatic Poem* (1841), having as its subject the early life of the Christians. It is a noble lyrical drama. Vivia's monologue on forswearing Jupiter is especially impressive. Mrs. Adams was the author of several beautiful hymns, among which are "Nearer, my God, to Thee" and "He sendeth sun, He sendeth shower." She was a Unitarian.

ADAMS, Suzanne (1873—). An American lyric soprano. She was born in Cambridge, Mass., November 28, 1873. She studied with Marchesi in Paris, and made her début at the Paris Opera in 1894 as Juliette in Gounod's *Roméo et Juliette.* She remained at the Opera three years, then went to Nice. In the summer of 1898 she appeared at Covent Garden, London, and during the season of 1898-99 at the Metropolitan Opera House, New York. In 1898 she was married to Leo Stern, the violoncellist, who died in 1904. Her rôles include, Juliette, Marguerite, Gilda, Queen in *Les Huguenots*, Queen of the Night in the *Magic Flute*, Mimi, and Micaela. Her voice is of beautiful quality and great compass, but is rather slender.

ADAMS, Thomas. An English preacher in the early part of the seventeenth century, called by Southey "the prose Shakespeare of Puritan theologians . . . scarcely inferior to Fuller in wit or to Taylor in fancy." He was minister at Willington, Wingrave, and London, and "observant chaplain" to Sir Henry Montague, the lord chief justice. Adams was a Puritan within the Church of England, as distinguished from the nonconformist Puritans who left the church. He published a large number of sermons, the quaint titles of two of which are: *Heaven and Earth Reconciled*, and *The Devil's Banquet*. It is likely that John Bunyan read and was influenced by these writings. They have been republished in Nichol's *Puritan Divines* (3 volumes, 1862).

ADAMS, William (?1575-?1620). The first Englishman in Japan, whose romantic story is closely connected with the opening of that empire. He was born in Kent, near the mouth of the Thames. Having entered the service of some Dutch merchants, he sailed, in 1598, for the east, from the Texel, as the chief pilot of a fleet of five small ships. After a severe voyage, the *Charity*, in which Adams was sailing, anchored off the coast of Bungo (Kiushiu). Iyéyasu had recently come to power, and Adams, after a brief imprisonment, was taken into his favor and employed in the government service, to its great advantage. He built vessels and gave helpful information in respect to the intrigues of the Spanish and Portuguese. At a later day he received the revenues of the village Hémi, near Yokosuka, the modern imperial dockyard in Yeddo Bay. In 1613, the *Clove*, an English ship, brought other Englishmen to Firando, and, with Adams, they proceeded to establish a factory, of which Richard Cocks was chief. In 1616 Iyéyasu died and foreigners soon fell into disfavor. Not being allowed to return to his wife and children in England, Adams married a Japanese wife, and their descendants are still living. He died May 16, 1620, and was buried on a hill above Hémi-Mura, where his tomb and that of his Japanese wife were discovered in 1872 by James Walter, an American. A street in Yedo was named after him, and a celebration is still held in his honor. Letters of Adams may be found in *Purchas his Pilgrimes*, and in the publications of the Hakluyt Society. Consult: *The Diary of Richard Cocks, 1615-22* (London, 1883); Hildreth, *Japan as It Was and Is* (Boston, 1855); and Griffis, *The Mikado's Empire* (New York, 1876).

ADAMS, William (1814-48). An English allegorist. He was educated at Eton and at Merton College, Oxford, where he became tutor and fellow in 1837. Appointed vicar of St. Peter's-in-the-East, Oxford, in 1840, he resigned because of his ill health, and passed the last four years of his life at Bonchurch, Isle of Wight. Adams was the author of several popular religious allegories, most of which were written during the years when he was slowly dying. They comprise *Silvio*, *The Shadow of the Cross*, *Fall of Crœsus*, *The Old Man's Home*, and the *King's Messengers*. They are all of interest, and the *Old Man's Home* is likely long to survive, because of its natural grace and charm. Adams is also the author of a boy's story entitled *Cherry Stones*, reprints of which are still frequent.

ADAMS, William (1807-80). An American Presbyterian clergyman. He was born at Colchester, Conn., graduated at Yale in 1827, and at Andover Theological Seminary in 1830. He became pastor of the Congregational church, Brighton, Mass., in 1831, and of the Broome Street Presbyterian church in New York City in 1834 (out of which the Madison Square Presbyterian church was formed in 1853), and there he ministered till in 1873 he became president of Union Theological Seminary (New York) and professor of sacred rhetoric. He died at Orange Mountain, N. J., August 31, 1880. He was moderator of the New School Presbyterian General Assembly in 1852. He published several volumes of discourses.

ADAMS, William Davenport (1851-1904). An English journalist and author, the son of W. H. Davenport Adams. He was educated at Edinburgh University and began newspaper work in 1870. He became literary editor of the London *Globe* in 1885, and is also well known as a dramatic critic. He has published many collections of poetry, several books about books, and edited a *Dictionary of English Literature* (1877) and a *Dictionary of the Drama* (1899).

ADAMS, William Grylls (1836—). An English physicist. He was born at Laneast, Cornwall, and was educated at Cambridge University, where he was made a fellow of St. John's College. In 1863 he was appointed professor of natural philosophy and astronomy in King's College, London, and has carried on many investigations in addition to giving instruction. Professor Adams has served as vice-president and president of the Physical Society of London, as president of the Society of Electrical Engineers, as president of the mathematical and physical section of the British Association, and is a member of the Royal Society. He devised a new form of polariscope which could be used to measure the optical axes of crystals. Among his more important investigations which have been published are those on *Simultaneous Magnetic Disturbances, Action of Light on Selenium, Alternate Current Machines,* and the *Testing of Dynamo Machines.*

ADAMS, William Taylor (1822-97). An American educator and writer of juvenile fiction, popularly known as "Oliver Optic." He was born at Medway, Mass. For twenty years he taught in Boston public schools; for fourteen years he was a member of the Dorchester School Committee, and he was once elected to the Legislature. His first book, *Hatchie, the Guardian Slave* (1853), was followed by more than a hundred volumes of juvenile fiction, contributed in large part to *Oliver Optic's Magazine,* of which he was the editor. These stories appeared in series, of which the most popular were: *The Boat Club, Young America Abroad, The Starry Flag, Onward and Upward,* and *The Yacht Club.* He published also two novels, *The Way of the World,* and *Living Too Fast.*

ADAM-SALOMON, ȧ′däɴ′-sȧ′lō′mōɴ′, Antony Samuel (1818-81). A French sculptor of Jewish extraction. He was born at La Ferté-sous-Jouarre (Seine-et-Marne). After a short mercantile career he became a modeler, and made such progress that he was provided with a scholarship by the authorities of his department and sent to Paris. His bust of Béranger, which he completed in his twentieth year, and which is said to have been largely executed from memory, established his reputation. Among his other works were busts of Lamartine, Rossini, Halévy, Littré, George Sand, Marie Antoinette, Delphine Gay, and others; medallions of Amyot, Copernicus, and Marchand Ennery; a bas-relief of Charlotte Corday; and the tomb of the Duke of Padua.

AD′AM'S APP′LE (Lat. *Pomum Adami*). The projection seen on the front of the neck nearly midway between the summit of the breastbone and the bone of the chin. It is particularly visible in males, but rarely noticeable in females, and then only at a late period of life. Its name originated from the superstition that a portion of the apple given to our first parent stuck in his throat, and that the enlargement thus caused has been transmitted to the race. It is produced by the convergence of the two quadrilateral plates of the thyroid cartilage of the larynx.

ADAM'S BRIDGE. A chain of shoals extending across the Gulf of Manaar, between Ceylon and the peninsula of Hindustan (Map: India, C 7). It is cut by several channels through which small boats can pass.

AD′AMSON, Patrick (1537-92). A famous Scotch prelate and writer, originally known as Conston, Constant, Consteane, or Constantine. He was born at Perth. He studied law at the University of St. Andrews and in 1566 went to France as a tutor, where he underwent six months' imprisonment for referring to the son of Mary, Queen of Scots, as King of France and England, in a Latin poem he wrote on the occasion of the prince's birth. He narrowly escaped death during the Paris massacre, and, obliged to live in concealment for seven months, he employed his time in writing Latin poetical versions of the Book of Job and of the tragedy of Herod. In 1573 he returned to Scotland, took orders, and became minister at Paisley. In 1576 he received the appointment of Archbishop of St. Andrews from his patron, the Earl of Morton, Regent of Scotland, and entered into frequent polemics with the Presbyterians concerning episcopacy. In 1588 he was excommunicated on various charges, and died in great poverty and affliction at St. Andrews, February 19, 1592. Consult: P. Adamson, *Poemata Sacra* (London, 1619); Baillie, *The Recantation of Patrick Adamson* (Glasgow, 1646).

ADAMSON, Robert (1852-1902). An English educator and philosophical writer. He was at one time professor of logic and mental philosophy at Owens College (Victoria University), and in 1895 was appointed professor of logic and rhetoric at the University of Glasgow. He is regarded as an important representative of the so-called Neo-Hegelian movement in English philosophy. Among his writings may be mentioned: *The Philosophy of Science in the Middle Ages* (1876); *On the Philosophy of Kant* (1879); the article on Kant in the *Encyclopædia Britannica,* and *Fichte* (1881).

ADAM'S PEAK (native, *Samanhela*). A mountain in the south of Ceylon, 7420 feet high, terminating in a narrow platform, in the middle of which is a hollow five feet long, having a rude resemblance to a human footprint (Map: India, D 7). Mohammedan tradition makes this the scene of Adam's penance, after his expulsion from Paradise; he stood 1000 years on one foot, and hence the mark. To the Buddhists, the impression is the *sripada,* or sacred footmark, left by Buddha on his departure from Ceylon; while the Hindus claim it as the footprint of their god Śiva. Over the sacred spot stands a wooden canopy, and multitudes of devotees, Buddhist, Hindu, and Mohammedan, frequent it.

ADANA, ȧ-dä′nȧ. The capital of the Turkish vilayet of Adana (15,400 square miles; pop. 422,400) (Map: Turkey in Asia, F 4). It is situated in the southeast of Asia Minor on the Seihun (ancient Sarus), about 42 miles northeast of the seaport of Mersina, with which it is connected by rail. Its position near the passes of the Taurus gives it strategical importance. The river is very deep, and Adana is the seat of considerable trade in cotton, wool, grain, and wood. The town has a large steam spinning-mill. Its population is about 45,000, including a large number of Armenians and Greeks. Adana was an important place in the time of the Romans. After a period of decline its prosperity revived under the caliph Harun-el-Rashid.

ADANG, ȧ-dăng′. A Malay-Negrito people in Ilocos Norte province, Luzon. See PHILIPPINES.

ADANSON, ȧ′däN′sôN′, MICHEL (1727-1806). A French naturalist and physicist. He was born at Aix, in Provence. He studied the natural and physical sciences under Réaumur and Jussieu in Paris, and journeyed to Senegal in 1749, where, during a period of five years, he engaged in researches in botany, electro-physics, and meteorology, and made collections of plants and animals. He was one of the first to recognize the electrical nature of the lightning stroke, and he demonstrated also the similarity of the shock from the electric eel (*Gymnotus electricus*) to the discharge from the Leyden jar. He was also one of the earliest to describe the mode of transportation and deposit of beach sands along oceanic coasts. On his return to Paris from Senegal he was elected a member of the Academy of Sciences. His most important work, however, was in botany, and he published many important monographs on various groups of plants and devised several schemes of classification, none of which latter has, however, received any considerable amount of recognition. Among his more important works are: *Histoire naturelle du Sénégal* (Paris, 1857; German edition, Leipzig, 1773); *Familles des plantes* (2 volumes, Paris, 1763); *Histoire de la botanique et plan des familles naturelles des plantes,* a posthumous work edited by his son, A. Adanson, and by Payer (2 volumes, Paris, 1864). For further particulars concerning his life and works consult Cuvier, *Eloge historique* (Paris, 1819).

AD′ANSO′NIA. A genus of the natural order Malvaceæ, named by Linnæus in honor of the botanist Adanson (q.v.). The best known species, Adansonia digitata, the Baobab, also called the Monkey-bread tree, is a native of the tropical parts of western Africa, but now introduced into the East and West Indies. It is one of the largest known trees—not, indeed, rising to a very great height, but exceeding most other trees in the thickness of its trunk (20 to 30 feet). Even its branches (60 to 70 feet long) are often as thick as the stems of large trees, and they form a hemispherical head of 120 to 150 feet in diameter, their outermost boughs drooping to the ground. The leaves are 5- to 7-parted; the flowers are white and extremely large, on drooping peduncles of a yard in length. The fruit, Monkey-bread, is of the size of citron. The bruised leaves (Lalo) are mixed with the food of the inhabitants of tropical Africa, and Europeans in that country employ them as a remedy for diarrhœa, fevers, and diseases of the urinary organs. The pulp of the fruit, which is slightly acid and pleasant to the taste, is eaten with or without sugar; and the expressed juice mixed with sugar is much esteemed as a beverage, being very refreshing, effectual in quenching thirst, and regarded as a specific in putrid and pestilential fevers. The bark is said to be powerfully febrifugal. A second, Australian, species, Adansonia Gregorii, is recognized by some botanists as distinct from Adansonia digitata. A third species is found in Madagascar and a fourth in East Africa.

AD′APTA′TION (Lat. *ad,* to + *aptare,* to fit). In plants, the adjustment of an organ or an organism to its environment or surroundings, as shown in its structural form, e.g., a thick-skinned leaf is an adaptation to a dry environment. The state of a perfectly adapted plant is sometimes called "epharmony," but this condition is rarely found, and the adaptations of most plants may be regarded as more or less imperfect. See ECOLOGY; NATURAL SELECTION.

A′DAR. The twelfth month of the ecclesiastical, and the sixth month of the civil, Jewish year, coinciding with February-March of the common year. The 7th of Adar became a fast for the death of Moses; the 9th another on account of the dissension of Hillel and Shammai; but more important is the 13th, which is called the fast of Esther, in memory of the fasting of Mordecai, Esther, and the Jews, whose destruction was threatened by Haman (Esther iv : 15-16). The fast is followed by the feast of Purim, celebrated on the 14th and 15th, in commemoration of the escape of the Jews of Persia from the fate designed for them by Haman, the cruel counselor of Ahasuerus. See ESTHER.

ADDA, ăd′dȧ (Lat. *Adua*). A tributary of the Po (q.v.), rising in the Rhætian Alps, on the northern borders of Italy above Bormio (Map: Italy, D 2). After traversing the Valtellina, it flows, or rather expands, into the Lake of Como. Below Lecco it traverses the plain of Lombardy in a direction south-southeast, passing Lodi and Pizzighetone, and falls into the Po about 8 miles above Cremona. Total length, about 180 miles; navigable for 75 miles.

AD′DAMS, JANE (1860—). A social settlement worker. She was born at Cedarville, Ill., September 6, 1860. She graduated at Rockford Female Seminary in 1881, and, together with Miss Ellen G. Starr, established (in 1889, at Chicago) the Hull House, the leading social settlement in the United States, of which she became the head worker and guiding spirit. Miss Addams has less sympathy with theoretical studies of the social problem than with everyday experience with all sorts and conditions of people. Her practical common sense, great executive ability, and fine, unselfish spirit have made her the natural leader of the settlement movement in this country. She has been a frequent contributor to current periodical literature on the nature of the social settlements, their relation to the labor movement, and to philanthropy, and various other topics, and published *Democracy and Social Ethics* (1902). See HULL HOUSE; SOCIAL SETTLEMENTS.

AD′DAX, or **AD′DAS** (Lat., of African origin). A hippotragine antelope (*Addax nasomaculatus*) of northeastern African deserts, related to the oryx. It is about three feet in height at the shoulders, robust in form, nearly white in color, tinged with reddish brown forward, and having a white blaze upon the nose, and black hoofs, large and rounded for treading upon the desert sands. It has long ears, a long, tufted tail, shaggy forehead and throat, and both sexes have high, spirally twisted horns, alluded to by Pliny when he described the antelope under the name strepsiceros. Its habits are similar to those of the oryx, and it is hunted by the Arabs with greyhounds. Consult: A. E. Pease, *Proceedings Zoölogical Society of London* (1896, page 810), who says that it is called by the French of Algeria "antilope du sud;" by the Arabs, "begra el Oouash" or "meha," and by the Tuaregs, "tameeta." See plate of LARGE ANTELOPES, in Volume 1.

AD'DER (*an adder* by mistake for *a nadder*, A. S. *nœddre*, Goth. *nadro*, Ger. *Natter*, a snake). A common name applied both to certain poisonous snakes, mostly of the family Viperidæ, and to certain harmless snakes of the family Colubridæ. In the former case it is practically a synonym of Viper (q.v.). Several venomous serpents are known as puff-adders and death-adders, under which names they will be found described and illustrated elsewhere. Various harmless snakes of the genus Tropidonotus are known as adders both in Europe and America, as well as the American Copperhead (q.v.), the water "adder" (see MOCCASIN SNAKE), and the spreading or blowing "adder" (see HOGNOSE), which, under provocation, assumes somewhat the appearance of a viper. Specifically, in English literature, the word usually means the common viper (*Vipera berus*) of Europe, the only venomous snake of Great Britain.

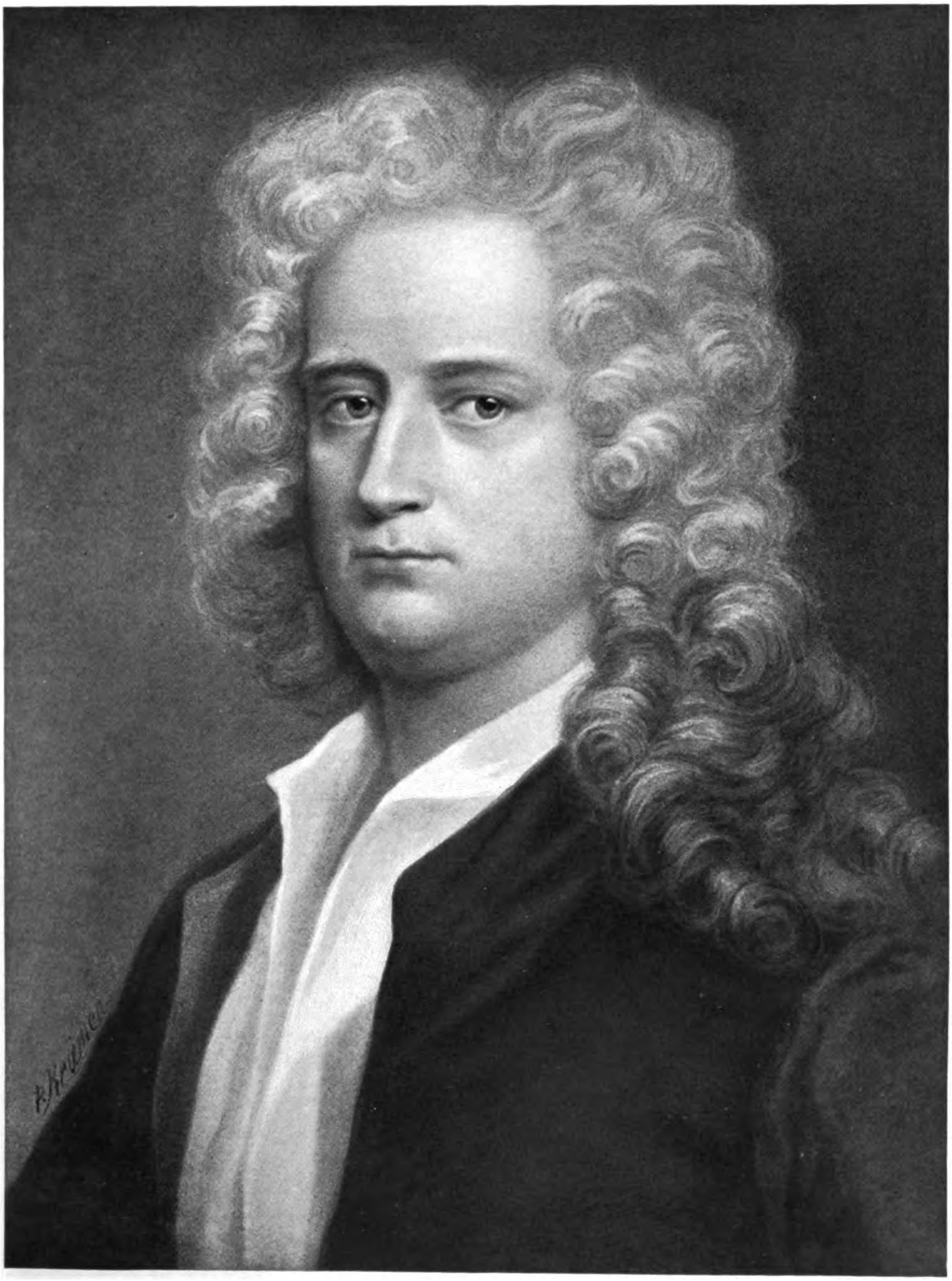
AD'DICKS, JOHN EDWARD (1841—). An American capitalist. He was born in Philadelphia, Pa., November 21, 1841. He acquired large interests in the flour trade of that city, and subsequently became prominent in the promotion of the manufacture of illuminating gas. In 1884 he organized, and was made president of the Bay State Gas Company of Boston, Mass., and in 1892 obtained the control and the presidency of the Brooklyn (N. Y.) Gas Company. He was a candidate in 1895 for the United States senatorship for Delaware, and, although he himself failed of election, was able to prevent that of his rival, H. A. du Pont. The ex-speaker of the State House, having become governor through the death of Governor Marvel, was permitted to cast a ballot in the legislative convention, and opportunity was thus obtained for contesting the election of Du Pont, whom the Democrats and Populists refused to seat. In 1896 two sets of delegates, representing respectively the Du Pont and Addicks factions, were sent to St. Louis, and the committee on credentials decided in favor of the Du Pont delegates. When, in 1899, a new senator from Delaware was to be elected, a deadlock ensued, and the senatorship remained vacant. Again, in 1900, two sets of delegates from Delaware were sent to the Republican National Convention, and on this occasion the committee on credentials ultimately decided in favor of the Addicks representatives, but in 1901 he was once more defeated in the senatorial election, and as at this time there were two senators to elect, the adjournment of the Legislature in March left Delaware totally unrepresented in the Senate of the United States. Delaware remained unrepresented until 1903, when, after another unsuccessful attempt to elect Addicks, a compromise was effected which brought about the election of Allee, an Addicks adherent, for the long term, and Ball, from the opposing faction, for the short term. At the expiration of Senator Ball's term, in 1905, Addicks's candidacy again brought about a deadlock, which, however, was broken on June 13, 1906, by the election of Du Pont.

AD'DINGTON, HENRY, FIRST VISCOUNT SIDMOUTH (1757-1844). An English Tory statesman. He was born at Reading. He graduated at Brasenose, Oxford, in 1778, studied law, and was admitted to the bar in 1784. Persuaded by his college mate and friend, the younger Pitt, he entered Parliament in 1783. Subsequently he filled the positions of speaker of the House of Commons, 1789-1801, and premier and chancellor of the exchequer, 1801-4. Owing to the opposition to his war policy, he resigned in 1804, but the King raised him to the peerage as first Viscount Sidmouth, and made him president of the Council (1805). He was lord privy seal in 1806, and again president of the Council in 1806 and 1807. He was home secretary from 1812 to 1822, and member of the cabinet from 1822 to 1824. Although a man of benevolent disposition, he became very unpopular through his coercive measures and retired into private life in 1824. He died at Richmond Park, February 15, 1844. Consult G. Pellew, *Life and Correspondence of the Right Hon. H. Addington, first Viscount Sidmouth* (London, 1847).

AD'DIS, WILLIAM E. (1844—). An English clergyman. He was born at Edinburgh and was educated at Merchiston Castle School, Glasgow College, and Balliol College, Oxford. He became a Roman Catholic in 1866, and was parish priest of Sydenham, 1878 to 1888, an assistant clergyman at Melbourne, 1888 to 1892, and Minister of the High Pavement Chapel (Unitarian), Nottingham, from 1893 to 1898. In 1898 he became professor of Old Testament criticism in Manchester College, Oxford. He is the author of the following works: *Catholic Dictionary*, written in conjunction with Thomas Arnold (fourth edition, 1884); *Documents of the Hexateuch* (2 volumes, 1893-98); *Christianity and the Roman Empire* (1893).

ADDIS ABEBA, äd'dês ȧ-bä'bȧ. The capital of Abyssinia, situated in the province of Shoa, in about lat. 9° N. and long. 39° E. (Map: Africa, H 4). It occupies an extensive area and is picturesquely situated at an altitude of over 8000 feet. In its general appearance it resembles more a camp than a capital city. The town is absolutely without any streets and is intersected in several parts by deep ravines. The royal palace is situated on an eminence and consists of a number of buildings of cheap and flimsy architecture surrounded by several walls. The permanent population is estimated at 50,000, and the floating population at 30,000. Addis Abeba was the scene of the signing of the treaty of peace between Italy and Abyssinia on October 26, 1896, in which Italy resigned her claim to a protectorate over Abyssinia.

AD'DISON, JOSEPH (1672-1719). An English poet and essayist. He was the son of Lancelot Addison, a clergyman of the Church of England, and was born at Milston, near Amesbury, in Wiltshire, May 1, 1672. After attending the Charterhouse and other schools, he entered Queen's College, Oxford, in 1687. Two years later he passed to Magdalen College. At Oxford he was distinguished for the ease with which he wrote Latin verse. By 1697 he was receiving high compliments from Dryden. He won the favor of Montagu (afterward Lord Halifax), and Lord Somers, through whom he obtained, in 1699, a pension of £300 a year. The pension was probably intended to enable him to prepare himself for diplomacy by foreign travel.



JOSEPH ADDISON
AFTER PAINTING BY KRAEMER

At any rate, he left England toward the close of 1699 for a Continental tour. While in France he became familiar with the language of the country. On the outbreak of the Spanish War of the Succession he went to Italy, where he wrote the most successful of his poems, the *Letter*, addressed to Lord Halifax. In the autumn of 1703 he returned home by way of Switzerland and Germany; but in his expectations of place he was disappointed, for the Whigs were out of office. The battle of Blenheim, however, which occurred the next year, presented a brilliant opportunity, which he did not fail to make the most of. The ministry wished the victory commemorated in verse, and Addison was appointed to do it. Lord Godolphin, the treasurer, was so pleased with the first half of the poem that before *The Campaign* was finished he made Addison a commissioner of appeals.

The poet was now fairly involved in politics. He became under-secretary of state in 1706, accompanied Halifax to Hanover the next year, and in 1709 went to Ireland as secretary to the lord-lieutenant, where he also obtained the office of keeper of the records, worth £300 a year. In the same year Sir Richard Steele began the *Tatler*, to which Addison soon became a frequent contributor. He also wrote a number of political articles in the *Whig Examiner*. On March 1, 1711, appeared the first number of the *Spectator*, which continued as a daily till December 6, 1712. In 1714 it was revived as a tri-weekly. In 1713 appeared the *Tragedy of Cato*, the popularity of which, considering its total want of dramatic power, is amazing. It was generally understood to have a political as well as a poetical inspiration; but so skillfully had Addison expressed himself, that both parties, Whig and Tory, received its cold declamations with rapture. It was translated into several European languages; and even the prince of French criticism, Voltaire, held Shakespeare a barbarian in tragedy compared with Addison. In 1716 Addison married the Dowager Countess of Warwick. The marriage was "uncomfortable." He reached his highest political position when he was appointed Secretary of State in 1717. For this place he was not at all suited, and he resigned the next year. Addison's health had been poor for some time, and, after an illness of a few months, he died at Holland House, Kensington, on June 17, 1719, three years after what Thackeray calls "his splendid but dismal union."

Thomas Tickell, whom Addison had appointed his literary executor, published his works two years later in four volumes, including, besides those already mentioned, papers Addison had written for the *Guardian* and the *Freeholder*, a play entitled *The Drummer, Dialogues on Medals*, and several poems. The most delightful and original of Addison's productions is that series of sketches in the *Spectator*, of which Sir Roger de Coverley is the central figure and Sir Andrew Freeport and Will Honeycomb the lesser ones. Sir Roger himself is an absolute creation; the gentle, yet vivid imagination, the gay and cheerful spirit of humor, the keen, shrewd observation, and fine raillery of foibles which Addison has displayed in this character make it a work of pure genius. In prose, Addison is always excellent. He gave a delicacy to English sentiment and a modesty to English wit which it had never known before. Elegance, which in his predecessors had been the companion of immorality, now appeared as the advocate of virtue. His style, too, is admirable. There are many nobler and grander forms of expression in English literature than Addison's, but there are none comparable to his in propriety and natural dignity. "Whoever wishes," says Dr. Johnson, "to attain an English style, familiar but not coarse, and elegant but not ostentatious, must give his days and nights to the volumes of Addison." His various writings, but especially his essays, fully realized the purpose which he constantly had in view, "to enliven morality with wit, and to temper wit with morality." He also did more than any other man of his time toward creating a wide public for literature. Consult: Johnson, *Lives of the Poets* (many editions); Macaulay, "Essay on Addison," *Edinburgh Review* (1843); Aiken, *Life of Addison* (London, 1843); Courthope, *Addison* (New York, 1884); and Beljame, *Le public et les hommes des lettres en Angleterre* (second edition, Paris, 1897).

ADDISON'S DISEASE. A disease characterized pathologically by pigmentation of the skin and by certain changes in the suprarenal glands. The pigmentation of the skin varies from a light yellowish brown to a dark brown or blackish color. Various changes have been described in the suprarenals, the most common being tuberculous inflammation. Fatty and waxy degenerations and carcinoma have also been described. The suprarenal glands, or adrenal bodies, were little understood till 1855, when Dr. Thomas Addison, of Guy's Hospital, London, published his work on their diseases. The most important of these is the one called after Dr. Addison. Its leading symptoms are anæmia, general languor and debility, remarkable feebleness of the heart's action, irritability of the stomach, and the peculiar bronzing (melasma) to which reference has been made. It is a rare disease, more common among the poor, far more frequent in males than in females, and generally occurs between the ages of thirty and fifty years. There may be profuse diarrhœa, also rheumatoid pains in the loins and abdomen, and the temperature is subnormal, except in those rare cases in which delirium, loss of consciousness, and convulsions occur. The bronzing is more pronounced on the face, neck, and backs of the hands, and upon points of pressure. The disease lasts from eighteen months to a few years. No curative treatment is known. Tonics, generous diet, proper climate, and the internal administration of suprarenal extract are beneficial. See Suprarenal Capsules.

ADDISON'S WALK. In the grounds of Magdalen College, Oxford, a tree-bordered walk to which Joseph Addison is said to have frequently resorted when he was a "demy" in that college.

ADDITION. The process of uniting two or more number groups into a single group. In elementary arithmetic, which deals with natural numbers, the process of addition is simply counting all the units of two or more collections into a single collection. The different groups added are called the *addends* and the result is called the *sum*. Since there is one and only one unit in the sum for every unit in the addends taken together, there is said to be a 1 to 1 correspondence between the sum and the addends. From this it appears that the sum is the same in whatever order the addends are taken or in whatever groups they may be placed. The former fact is expressed by saying that addition is commutative, and the latter by saying that addition is associative. See article Associative Law.

AD′DLED PAR′LIAMENT, The. A name given to the second parliament of James I. of England, 1614, because it did not produce a single statute. It holds, nevertheless, a noteworthy place in the history of constitutional liberty. Its members were chosen at a contested election, the first which had occurred for many years. The principle at issue was the right of parliament to grant all supplies. It is significant that three hundred members, or about two-thirds of the entire number, were then elected for the first time. Among these new men were John Pym and Sir Thomas Wentworth, each destined to take a leading part in the coming struggle. After a two-months' session the parliament was dissolved by the King, because it declined to grant him a supply of money without a proper settlement of the question of the imposts.

ADDRESS′, Forms of. See Forms of Address.

ADE, George (1866—). An American humorist and playwright, born at Kentland, Ind. He graduated at Purdue University in 1887, and was in newspaper work in Lafayette, Ind., and Chicago from 1887 to 1900. In *Fables in Slang* and other similar volumes, he showed considerable cleverness as a satirical humorist. In a somewhat similar vein he afterward wrote such plays as *The Sultan of Sulu* (1902); *Peggy from Paris* (1903); *The County Chairman* (1903); *The Sho-Gun* (1904); *The College Widow* (1904) and *Just Out of College* (1905).

A′DEE, Alvey Augustus (1842—). An American official. He was born at Astoria, N. Y. In 1870 he was appointed secretary of legation at Madrid, and in 1878 chief of the diplomatic bureau at Washington. He served from 1882 to 1886 as third assistant secretary of state, and in the latter year was promoted to be second assistant. He was acting Secretary of State during the Chinese trouble in 1900.

AD′ELAAR (Norw. The Eagle). An appellation of Curt Sivertsen (1622-75), one of the greatest naval commanders of the seventeenth century. He was born at Brevig, in Norway, and in his twentieth year was employed in the naval service of Venice against the Turks. On one occasion he broke through a line of sixty-seven Turkish galleys which surrounded his ship, sank fifteen, and burned several others. Frederic III. engaged him as admiral of the Danish fleet; and in 1675, under Christian V., he took the command of the whole of the Danish naval force against Sweden, but died suddenly at Copenhagen before the expedition set out. See Brunn, *Curt Sivertsen Adelaar* (Copenhagen, 1875).

AD′ELAIDE. The capital of South Australia, on the Torrens, 7 miles by rail from its harbor, Port Adelaide, on the Gulf of St. Vincent, and 508 miles northwest of Melbourne (Map: Australia, F 5). It has a large trade in agricultural produce and wool; lead and copper are mined in the vicinity, and its industries include iron foundries, potteries, tanneries, breweries, woolen, starch, and soap factories. The Torrens, artificially converted into a fine river, spanned by several bridges, divides the town into north and south Adelaide. The streets are broad and regularly laid out. It is the seat of a United States consular agent, the see of Anglican and Catholic bishops, contains numerous churches, a university, several colleges, a meteorological observatory, and extensive botanical gardens, including a museum of economic botany. The town is almost surrounded by the reserved park lands half a mile wide. Large water-works and reservoirs, from six to seven miles distant, and the cemeteries, are the property of the South Australian government. There are municipal abattoirs. The streets and park lands cover 2300 acres. Founded in 1836, the city was named after Adelaide, queen of William IV. Pop., 1901, 39,200; 1904, 39,625; including suburbs, 170,729. Port Adelaide, its port, protected by two forts, has a safe and commodious harbor, with a dock for ocean steamers, and extensive quays. Pop., 5000. Consult: G. T. Ellery, "Greater Adelaide," in *Municipal Extension* (Adelaide, 1899); "City of Adelaide," in *Municipal Journal*, IX., 237 (London, 1900).

ADÉLAÏDE, à′dâ′lȧ′ēd′, Eugénie Louise (1777-1847). Princess of Orleans, sister of Louis Philippe. Proscribed in the Revolution as an *émigrée*, she sought refuge in the Netherlands, Switzerland, and Germany (1793). Ten years later she met her brother in Spain, and was with him until the Restoration, using her influence to induce him to accept the crown. From 1830 to 1847 she played an influential part in politics.

AD′ELARD, or **ÆTH′ELHARD, OF BATH.** An English philosophical writer who lived about the beginning of the twelfth century. He is said to have studied at Tours and Laon. His works include *Perdifficiles Quæstiones Naturales* (printed toward the end of the fifteenth century); *De Eodem et Diverso* (before 1116), an allegory in which worldliness and philosophy are represented as endeavoring to win the soul of man; and a Latin translation of *Euclid* (printed 1482), made at a time when that work was almost unknown in western Europe. He also translated and wrote several other treatises on mathematical and medical subjects which are to be seen in MSS. in the libraries of Corpus Christi and Trinity Colleges, Oxford.

AD′ELBERT COL′LEGE. See Western Reserve University.

AD′ELOCHOR′DA, or **HEM′ICHOR′DA** (Gk. ἀδηλος, *adēlos*, unclear, invisible + ἡμι-, *hēmi-*, half + Lat. *chorda*, a cord, a dorsal nervous cord). A sub-class of the Chordata, including Balanoglossus and its allies. See Balanoglossus, and Plate of Ascidians.

ADEL′PHI, The (from Gk. ἀδελφοί, *adelphoi*, brothers). A locality in London between the Strand and the Thames Embankment, a little distance east of Charing Cross. The name came from the fact that the Adelphi Terrace, which lies in it, was laid out in 1768 by the brothers Adam, whose names appear in Adam Street, James Street, William Street, John Street, and Robert Street.

ADELPHI COL′LEGE. An American college, situated at Clifton and St. James Places and Lafayette Ave., Brooklyn, New York City. It was incorporated 1896, grants the degrees A.B., M.A., and B.S., and maintains subordinate normal and art departments, besides a preparatory academy. It has a library of 11,000 volumes; faculty, 1906, 34; students, 270 collegiate, 75 normal, and 70 art.

ADELPHI THE′ATRE. A theatre on the Strand, London, more fully designated the Royal Adelphi Theatre. It dates from 1806, but was rebuilt on a larger scale in 1858. It was known chiefly for its melodramas and farces.

ADEL′PHŒ, or **ADEL′PHI.** The latest of the six extant comedies of Terence (q.v.). It was produced in 160 B.C. at the funeral games of L. Æmilius Paulus, and was derived chiefly from the *'Αδελφοί*, *Adelphoi* ("Brothers") of Menander, but also in part from the *Συναποθνήσκοντες*, *Synapothnēskontes* ("Dying Together") of Diphilus. Molière is said to have owed to it the idea of his *École des maris*.

ADELSBERG, ä′dels-běrk (Sloven. *Postojna*). A small market town of the Austrian crownland of Carniola, about 50 miles east-northeast of Triest by rail. It is famous for its wonderful stalactite cavern, the largest in Europe and one of the finest known. It may be explored for more than two miles, and is penetrated for about 800 yards by the river Poik, which then disappears in the bowels of the earth. The cavern consists of several different chambers. The largest is the Franz Josef and Elisabeth grotto, 223 yards in length by 214 yards in breadth. The stalactite and stalagmite formations are particularly notable for their beauty and variety.

ADELUNG, ä′de-lụng, FRIEDRICH VON (1768-1843). A German philologist. He was born at Stettin, studied philosophy and jurisprudence at Leipzig, went later on to Russia, and was tutor to the grand duke, later Czar Nicholas. In 1824 he was appointed director of the Oriental Institute, at St. Petersburg, and in 1825 president of the Academy of Sciences. He is chiefly known for his researches respecting foreign sources for Russian history, the most important results of which are embodied in the *Kritisch-litterarische Uebersicht der Reisenden in Russland bis 1700* (1846). He also wrote on Sanskrit language and literature such volumes as *Versuch einer Litteratur der Sanskritsprache* (1830).

ADELUNG, JOHANN CHRISTOPH (1732-1806). A distinguished German linguist and lexicographer. He was born at Spantekow, Pomerania; was a journalist and author at Leipzig from 1761 to 1787, and from 1787 until his death chief librarian of the Electoral library at Dresden. He is principally known for his historico-critical studies of the German language. His chief works are his *Wörterbuch der hochdeutschen Mundart* (Dictionary of High German, 1774-1802), in which he took Dr. Johnson as his model, and his *Ueber den deutschen Stil* (1785-86).

ADEMP′TION (Lat. *adimere*, to take away). The destruction of a legacy either by voluntary act of the testator, or by loss or destruction of the thing bequeathed. The term is properly used only in connection with legacies, although it is sometimes used interchangeably with advancement (q.v.), and some courts also treat the term as synonymous with satisfaction. If a testator *in loco parentis*, before his death, made a gift to his legatee of the same kind as the legacy, the presumption is that the gift was made as part of, or in place of, the legacy; and it is, therefore, adeemed *pro tanto*. Specific legacies may be adeemed by the sale or alienation of the property bequeathed, or by its loss or destruction, and general legacies may be adeemed by lack of sufficient assets to pay them. See article LEGACY.

ADEN, ä′den *or* ā′den. A peninsula and town near the southwestern end of Arabia situated in lat. 12° N., and long. 45° 5′ E., and connected with the mainland by a narrow sandy isthmus (Map: Asia, O 7). In a broader sense the name of Aden is applied to the whole British territory in that part of Arabia, which includes, besides the peninsula and the isthmus, a small strip of territory on the mainland, with a total area of about 75 square miles. The peninsula proper is of volcanic origin and reaches in the peak of Jebel Shan-shan an altitude of 1775 feet above the sea. The climate of the region is healthful, but the scarcity of rain makes cultivation of the soil impossible, so that all the necessaries of life have to be imported. Water is obtained partly from the wells within the crater in which the town of Aden is situated, and partly from the hills. The town of Aden is strongly fortified. The most populous settlements are Steamer Point and Shaikh Othman on the mainland. There are two harbors, but only one of them, Aden Back Bay, on the western side of the peninsula, is of any commercial importance. Owing to its favorable location, Aden was of considerable importance already in Roman times, when it was an entrepôt for the trade between the Roman Empire and the east. In the beginning of the sixteenth century it was taken by the Portuguese, who were succeeded by the Turks in 1535. From the seventeenth century until the British occupation, Aden was under the rule of the Sultan of Sana and some native chiefs. In 1839 it was captured by the British as a punishment for the maltreatment to which the crew of a shipwrecked British vessel had been subjected by the natives in 1837. With the island of Perim, Aden constitutes a dependency of the Bombay presidency, and is an important coaling station. The population, which was at one time reduced by internal disorder to less than 1000, was 43,974 in 1901. The imports amounted to over $16,931,000 in 1905-6, and the exports to about $15,124,000. The chief articles of export are coffee, gums, hides, skins, piece goods, and tobacco. The territory is administered by a political Resident, who is also the military commander. An extensive territory in Arabia, officially reckoned a British protectorate, Perim, Socotra, and the Kuria Muria islands, are administrated from Aden. An agreement defining the boundaries of the British sphere of influence in the Aden Hinterland was concluded with the Turkish government in 1902, and the delimitation of the frontier was completed in 1905. Consult: F. M. Hunter, *Aden* (London, 1877).

ADENEZ, ȧ′d’-nȧ′, or **ADANS LE ROI**, ȧ′däɴ′ le rwä′, also written ADENÈS and ADENET. A trouvère of the thirteenth century. He is first known as a minstrel at the court of Henry III., Duke of Brabant, whose reign ended in 1261. Later he was for a time in the service of Guy de Dampierre, Count of Flanders; then he went to France, where he was in high favor with the royal family. His surname of *le Roi* is commonly understood to have come from the authority which he exercised as leader of the minstrels at the Brabantine court. His greatest work is the *Cléomadès* (of which an edition was published in two volumes, Brussels, 1863-66), a long poetical romance. Previously he had written, on the basis of *chansons de gestes* from the epic cycle of Charlemagne, *Les enfances Ogier* (edited Brussels, 1874), and *Berte aus grans piés* (edited Paris, 1832), and also *Buèves de Commarchis* (edited Brussels, 1874).

ADENIS-COLOMBEAU, ȧ'd'nā'kō'lôɴ'bō', Jules (1821—). A French dramatist. He was born at Paris and was educated at the College Bourbon (Lycée Condorcet). He has written a large number of comedies and vaudevilles, as well as libretti to comic operas and operettas. Among his independent works are: *Philanthropie et repentir* (Paris, 1855); *Une crise de ménage* (Paris, 1857); *Les chasseurs et la laitière* (comic opera in one act, music by Gevaert, Opéra Comique, Paris, 1865); *Les trois souhaits* (comic opera in one act, music by Poise, Opéra Comique, 1873). In collaboration with Plouvier, Decourcelle, Tourte, Granvallet, Rostaing, and others, Adenis-Colombeau has produced works, of which the following are the more important: *Madame Pygmalion* (Bouffes Parisiens, 1863); *La jolie fille de Perth* (opera in four acts, music by Bizet, Théâtre Lyrique, 1867); *La czarine* (drama in five acts, Ambigu, 1868); *La fée des Bruyères* (Brussels, 1877); *Les templiers* (opera in five acts, Brussels, 1886).

ADENITIS, ăd'ē-nī'tĭs, or **LYMPHADENITIS**, lĭm'făd- (Gk. *ἀδήν*, *adēn*, gland; Lat. *lympha*, water). A term used in medicine to indicate inflammation of the lymphatic glands. Lymphangitis is inflammation of the lymphatic vessels which lead into and bind together these glands. In both structures the inflammation may assume an acute or chronic form. Acute lymphadenitis and lymphangitis usually have their origin from a wound or from some form of sore on the skin or a mucous membrane. The inflammatory process extends from the initial lesion along the chain of lymphatic vessels, and its presence is indicated by bright red lines over the course of the lymphatic vessels leading from the wound, and by heat, swelling, pain, and tenderness in the glands with which these vessels communicate. If infective micro-organisms, bacteria, are present at the time of the injury, or subsequently find their way into the tissues, a suppurative inflammation results, and pus is formed in and around the affected glands. Where the inflammation is severe, or the infection intense, such general symptoms as fever, headache, vomiting, and prostration are apt to be present. The chronic forms of adenitis are usually due either to tuberculosis or syphilis. In addition to the local enlargement of the glands, and the softening and suppuration that often follows, are usually found the general symptoms of the two diseases named. The treatment of the acute form of adenitis consists in putting the affected part at perfect rest, using such bandages and supports as may be necessary, the application of moist antiseptic dressings, the use of an unstimulating diet and of laxatives. If suppuration ensues, an incision must be made and the pus allowed to escape. The chronic forms of adenitis are met by tonic and constitutional treatment, and in some cases by removal of the affected glands.

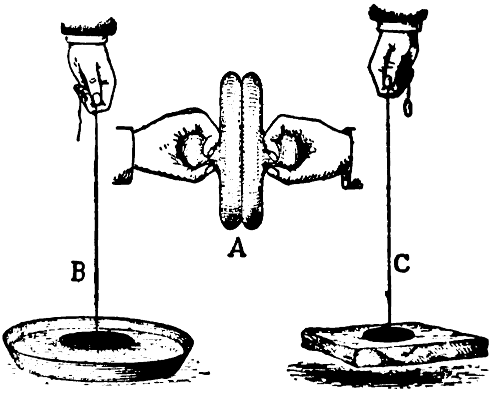
ADERBAIJAN, ä'dĕr-bī-jän', or **ADERBIJAN**. See Azerbaijan.

ADERNÒ, ä'dĕr-nō'. A city of Sicily, 23 miles northwest of Catania, southwest of Mount Etna, and 1840 feet above the sea (Map: Italy, J 10). The quadrangular castle erected by Roger I. is now used as a prison and the interior is very dilapidated. In the chapel are remains of frescoes showing his granddaughter, Adelasia, in the act of taking the veil. The convent of Santa Lucia was founded by him in 1157. The ancient Hadranum was celebrated for the temple of Hadranos, guarded by 1000 dogs, and the tourist can see fragments of it outside the town at Castellemi. In the valley of the Simeto, a couple of miles west of Adernò, are the remains of a Roman aqueduct. Adernò is the market town of a considerable agricultural district. Pop., 1901, 25,859.

ADERSBACH ROCKS, ä'dĕrs-bäG. A group of sandstone rocks near the village of Adersbach, in Bohemia. They are about four miles long and over one mile in width, and rise in some parts over 200 feet. They are remarkable for their fantastic form, which has been produced by the rain, frost, and other atmospheric changes. During the Thirty Years' War the miserable people of Bohemia often found refuge in this locality.

ADHER'BAL. Eldest son and one of the heirs of Micipsa, King of Numidia, who died 118 B.C. He was killed by order of Jugurtha (q.v.) six years later.

ADHE'SION (Lat. *adhæsio*, a sticking to, from *ad*, to + *hærere*, to stick). The phenomenon observed when two bodies are brought into close contact, viz. they become so attached to each other that it requires force to separate them. Adhesion is seen in the case of two solid bodies when their polished surfaces are pressed together, as in the case of the two lead disks shown in the figure at A; but it is more evident between solids and fluids, owing to their intimate contact (see B and C). We have instances of this in the film of water adhering to a piece of glass which is dipped in water and then removed. The adhesion of gases to the surface of solids plays an important part in many processes. A condensed atmosphere of gases surrounds every body, and every particle of a powdered or porous body has its own surface layer of gases. This property of powdered bodies to retain gaseous atmospheres in a state of great condensation is called adsorption.



ADHESION.

ADHESION, In Pathology. The term refers to the closing of a wound. If the granulating surfaces (see GRANULATION) be kept in contact, the opposite granulations may fuse together and the wound unite by secondary adhesion. Serous membranes, such as the pleura, the pericardium, and the peritoneum, when inflamed often become adherent. After operation involving any of these membranes similar inflammatory adhesions may occur. In inflammations of the appendix vermiformis (see VERMIFORM APPENDIX) and the pelvic organs (see UTERUS; OVARIES; FALLOPIAN TUBES), more or less extensive adhesions are apt to occur, interfering with the free motion of the organs or actually drawing them out of proper position. Such adhesions are often the cause of chronic conditions following acute inflammations of these parts.

ADHESION, IN PLANTS. The term is sometimes applied to an apparent coalescence of adjacent cycles, e.g., stamens which seem to be borne upon the tube of the corolla are called "adherent." The term is now passing into disuse.

ADIABATIC. Without transfer of heat. See THERMODYNAMICS.

AD'IAN'TUM. See MAIDENHAIR.

AD'IAPH'ORISTS (Gk. *ἀ*, *a*, priv. + *διάφορος*, *diaphoros*, different). The name given to Melanchthon and those who agreed with him in submitting, in "things indifferent," to an imperial edict. When, in 1548, Charles V. issued an edict called the Augsburg Interim, relating to disputed religious doctrines, Melanchthon drew up the Leipzig Interim, in which he yielded several doctrinal and liturgical points as *adiaphora*, "things indifferent." This stirred up a vigorous controversy, which lasted till the adoption of the Formula of Concord (1577), which lays down the law on the matter.

ADI-BUDDHA, ä'dê-bōōd'dȧ (Skr., the primordial Buddha). A conception of the supreme deity which arose about the tenth century, and prevails especially among the northern Buddhists. He is the spiritual source out of whom through successive emanations of the five Dhyani Buddhas (q.v.) and their less perfect Bodhisattvas (q.v.) came all the visible creation. The similarity of this view to certain Gnostic theories has suggested that it may have been indirectly affected by contact with Eastern Christianity. See BUDDHISM.

ADIGE, ä'dê-jȧ (ancient *Athesis*). A river of Austria-Hungary and Italy, rising in the Rhætian Alps of Tyrol (Map: Italy, F 2). It is formed by the union of numerous streamlets near Glarus, where it is called Etsch, a name by which the entire river is known in Germany. It flows in a general southern direction past Meran and Trent, entering Italy midway between Roveredo and Verona. A few miles above the latter town it turns southeast and enters the Adriatic above the Po. Its total length is 250 miles, for 180 of which it is navigable, although not without difficulty, owing to its swift current. It is connected with the Po by a small navigable canal called Adigetto. Its most important tributaries are the Eisack and the Avisio. The Adige is a transit river for the trade of Germany and Italy.

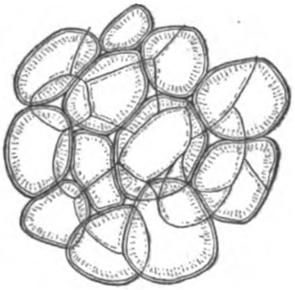
ADI-GRANTH, ä'dê-gränth (primal book). The Bible of the Sikh religion (see SIKHS). It consists largely of poems and legends originating with Nanak (1469-1538 A.D.), the founder of the sect, and the "gurus" ("divine revealers") who immediately succeeded him, its materials having been collected by Arjun (1584-1606), the fourth of these successors. Many of its passages show a very elevated conception of the deity, and deal with such problems as predestination, the freedom of the will, etc. Its ethical teachings are notably such as combat the sins of personal selfishness and attachment to the pleasures of the world. A second granth (book), known as the "Granth of the Tenth Reign," was composed in 1696 under the direction of Govind Singh, the last of the ten gurus. This more especially exalted the martial virtues and added further legends of the incarnation of God. The sacred books are treated with great veneration in the assemblies of the Sikhs.

A'DIP'IC ACID, $C_4H_8(COOH_2)$. A dibasic acid similar to oxalic acid. It is often obtained in the oxidation of fats by nitric acid.

ADIPOCERE, ăd'ĭ-pô-sēr' (Lat. *adeps*, fat + *cera*, wax). A peculiar mixture of fatty acids resulting from the decomposition of animal bodies buried in moist places. Human bodies have been found, on disinterment, reduced to this state.

AD'IPOSE SUB'STANCES (Lat. *adeps*, fat, grease). Same as fats (q.v.).

AD'IPOSE TIS'SUE. A peculiar kind of animal membrane or tissue consisting of an aggregation of minute spherical vesicles of areolar tissue filled with fat or oil. The tissue itself is organic and vital, the vesicles secreting the fatty matter from the capillary blood-vessels with which they are surrounded; the secreted product—the fat—is unorganized and devoid of vitality. The adipose tissue differs from cellular or filamentous tissue in having the vesicles closed, so that the fat does not escape even when fluid. A dropsical effusion which infiltrates the filamentous tissues does not affect the adipose tissue. There is a considerable layer of adipose tissue immediately under the skin; also around the large vessels and nerves, in the omentum and mesentery, around the kidneys, joints, etc. See FATS.



ADIPOSE TISSUE (MAGNIFIED).

AD'IRON'DACKS. The name of a group of mountains in northeastern New York. They lie west of the main axis of the Appalachians, as represented in the Green Mountains of Vermont, and constitute quite an independent mountain system. The name Adirondack is applied in a wider sense to that area embracing about 12,500 square miles contained between the valley of Lake Champlain, the St. Lawrence, and the Mohawk rivers. The counties of Essex, Clinton, Franklin, St. Lawrence, Lewis, Herkimer, Hamilton, and Warren lie partly or wholly within its limits. The more mountainous portion is on the east, and the higher peaks are chiefly within Essex County. From northeast to southwest the individual mountains become less pronounced, and the surface grades into a plateau of 1500 to 2000 feet altitude. Two peaks, Mount Marcy and Mount McIntyre, are above 5000 feet in altitude, while several others, Whiteface, Dix, Giant, Haystack, Skylight, and the Gothics, closely approximate this height. The mountains are grouped in minor ranges, which run a little east of north, and which are separated by deep, often narrow, valleys, as the depressions of Lake George, of the Schroon-Boquet rivers, of the Boreas-Ausable, and other rivers. The ranges approach Lake Champlain, *en échelon*, and produce on the lake shore a succession of bold, rocky headlands, and open, receding bays and valleys. As a rule, the mountains are dome-shaped in their outlines; but some sharp peaks, like Whiteface, exist. Precipitous escarpments over 500 feet high are common. Thus picturesque passes occur which are a delight to travelers. The best known are Wilmington Notch, Indian Pass, and Avalanche Pass. Deer's Leap and Roger's Rock on Lake George are similar.

DRAINAGE. The mountains constitute the water-shed between the Hudson and the St. Lawrence drainage systems, but the actual divide is a very irregular line that is due to the glacial drift. Thus Lake Champlain and Lake George rise far to the south and discharge into the St. Lawrence; small ridges of drift alone separate them from the Hudson, which rises a hundred miles to the northwest of the heads of their basins, and flows around their southern ends. In the heart of the mountains rocky divides of older date separate the streams. The main tributaries of the Hudson are the Sacondaga, Schroon, Boreas, and Indian Rivers. The Mohawk receives East and West Canada creeks. The Black River carries to Lake Ontario the contributions of the Moose, Beaver, and several minor streams. The Indian, Oswegatchie, Grass, Raquette, St. Regis, Salmon, and Chateaugay flow into the St. Lawrence. The Chazy, Saranac, Ausable, and Boquet discharge into Lake Champlain. In the eastern portion all these streams follow the northeast-southwest structural lines until they can break across the ridges to the great lines of drainage.

LAKES. The region has many lakes. The largest are lakes Champlain and George, but hundreds of smaller ones add an indescribable charm to the scenery. The greater number are due to barriers of glacial drift that block the streams. Often they run in chains, apparently indicating former great lines of drainage. The Fulton chain, Raquette, Forked, Long, and Saranac lakes are strung out in a northeast and southwest series, and are familiar summer resorts.

GEOLOGY. The Adirondack region is formed almost entirely of ancient Pre-Cambrian crystalline rocks. Gneisses and coarsely crystalline igneous varieties abound, and many smaller areas of crystalline limestones and quartzites are present. The gneisses and crystalline limestones are without doubt equivalents of the Grenville series of Canada. The most abundant igneous rocks are anorthosites, or labradorite rocks, and syenites. All the higher peaks are formed of the labradorite rocks. Basaltic and trachytic dikes, usually but a few feet wide, often intersect these older rocks. On the borders of the ancient crystallines, and on the southeast, as rare exposures from 25 to 40 miles from their edges, are the Paleozoic sediments, beginning with the Potsdam sandstone of the Cambrian system and terminating with the Utica slate of the Ordovician. All the Paleozoic rocks dip at low angles, and while small folds may be sometimes seen, the strata usually appear in faulted blocks. No rocks are found between the Utica slate and the glacial deposits of the Pleistocene period, so that the geological history of this long space of time can only be imperfectly inferred from the physiography. The great ice sheet moved from the northeast to the southwest, and covered the highest summits. It spread a mantle of sand and boulders all over the region. On its melting many temporary lakes were formed, of which beaches and deltas are often found. During the Champlain submergence, clays were deposited in great quantities in the Champlain Valley.

FLORA. The flora is of a pronounced northern character as compared with that of southern New York, but it naturally varies with the altitude. On the higher summits many small boreal plants remain as relics of the glacial epoch. The tree distribution is significant. Chestnuts penetrate only the southern and lower and more open valleys, whereas the spruce is found only at 1000 feet and more above the sea.

FAUNA. The animals are likewise those of the North. Moose, though once abundant, are now exterminated. Black bears are frequent, and deer are numerous because protected by game laws. The smaller animals are those characteristic of the North. Of fish, black bass and brook trout are most sought, and in the larger lakes, lake trout are frequent. Salmon are now extinct.

RESOURCES. The Adirondacks contain vast deposits of iron ore, chiefly magnetite, which is extensively produced near Port Henry, on Lake Champlain, at Lyon Mountain on the north, and at the Benson mines on the west. The region was once the home of the bloomery process, but almost all the old forges are in ruins. At the head waters of the Hudson on Lake Sanford there are immense bodies of titaniferous magnetite not as yet utilized. Building stone in the form of green granite has been quarried near Keeseville, and a highly prized sandstone is produced near Potsdam on the northwest. Marble is found near Gouverneur on the west, and to some extent in the Champlain Valley. Talc is extensively mined near Gouverneur. Graphite occurs in the vicinity of lakes George and Champlain.

The products of the forests form the most important industries. For lumber, the pine trees have been practically exhausted; spruce is the chief wood sought. The paper-pulp mills, however, consume much more than do the saw-mills. They take either spruce or poplar. The former is stripped from the mountains, where it may not grow again, but the latter rapidly renews itself upon the sandy barrens. After the timber has been cut off, and more especially in earlier years, when the outer mountains were stripped for charcoal, the owners often allowed the taxes to remain unpaid until the tracts were sold by the State at public auction. The State itself has at these times acquired extensive possessions, to which it adds yearly, with a view of preserving the waterways and forming a great public park for the people. Enormous tracts.

are also held by private individuals and clubs as recreation grounds. Forestry has received much attention from the State authorities.

Summer Resorts. The Adirondack region is one of the most important places for summer recreation for the dwellers in cities of the northeastern United States, and many thousands turn annually to it. Lake George, Schroon Lake, Lake Placid, the Saranacs, the Fulton chain, Long Lake, the Keene Valley, and dozens of other localities attract their habitual visitors. The climate is especially adapted to the treatment of pulmonary complaints. Saranac Lake, with its well-known sanitarium, is the chief resort. The establishment of State sanitariums has received favorable consideration from the State government.

Bibliography. For geology and mineral resources, see *Reports of the New York State Geologist*, and *Bulletins of the New York State Museum*, especially those since 1888, containing papers by J. F. Kemp, C. H. Smyth, Jr., H. P. Cushing, and others. For botany, see *Reports of the State Botanist*, and especially *Bulletin 28 of the State Museum*. For forestry, see *Reports of the State Forestry Commission*. All these are published at Albany.

AD'IT (Lat. *aditus*, access, approach). A nearly horizontal passage opened for the purpose of entering and draining a mine. In the United States it is usually called a *tunnel*, though the latter, strictly speaking, passes through a hill and is open at both ends. Filled with water, adits are often used as canals, by which the products of mines may be transported. Water raised from a depth greater than that reached by the adit is discharged through it, saving the cost of raising it still farther to the top of the shaft. An adit in Cornwall opens at the level of the sea, and extends inland about 30 miles, draining the district of Gwennap. It meets some shafts at the depth of 400 feet. The Ernst August adit in the Hartz Mountains is 13 miles long. The Joseph II. adit at Schemnitz, in Hungary, is 10 feet high, 5¼ feet wide, extends 10 miles to the Valley of the Gran, and is used as a canal and railway passage. The Sutro Tunnel, draining the Comstock lode in Nevada, is 4 miles long.

ADIVE'. The Tibetan fox. See Fox.

AD'JECTIVE (Lat. *adjectivum*, from *ad*, to + *jacere*, to throw, add, literal translation of the Gk. ἐπιθετικόν, *epithetikon*, something added). One of the parts of speech in grammar, a word joined to a substantive to extend its meaning and to limit its application. When *tall* is joined to *man* there are more properties suggested to the mind by the compound *tall man* than by the simple name *man;* but *tall man* is not applicable to so many individuals as *man*, for all men that are not tall are excluded. Adjectives are variously classified. The following classification is simple and sufficiently complete: Descriptive adjectives, or adjectives of quality and of quantity, and pronominal adjectives. The articles (q.v.) are sometimes included in this class. Nouns, or names of things, are often used in English as adjectives; thus, we say a *silver chain*, a *stone wall*. In such expressions as "income-tax assessment bill," *income* plays the part of an adjective to *tax*, which is, in the first place, a noun; the two together then form a sort of compound adjective to *assessment;* and the three, taken together, a still more compound adjective to *bill*, which, syntactically, is the only noun in the expression. Languages differ much in their way of using adjectives. In English the usual place of the adjective, when it is not in the predicate, is before the noun. This is also the case in German; but in French and Italian it may follow. In these languages, again, the adjective is varied for gender and number, and in the German for case also. In English it is now invariable, and in this simplicity there is a decided superiority; for in modern languages these changes in the adjective serve no purpose. The only modification of which the modern English adjective is capable is for degrees of comparison.

ADJECTIVE COL'ORS. Those colors in dyeing which are fixed by a base or mordant to render them permanent, as distinguished from *substantive colors*, in which the dye in its natural hue is fixed without the use of a mordant.

ADJECTIVE LAW. The term applied to the rules of law relating to procedure, as distinguished from substantive law (see Substantive Law), which is the term applied to the common law rules of right which courts are called upon to enforce. Thus, the rule that the owner of real estate is entitled to recover damages for trespass upon it is a rule of substantive law; but the rules determining to which court he should apply for relief and the method he should adopt to obtain it are rules of adjective law. Adjective law thus comprehends the law of the forum, including the conflict of laws, pleading, evidence, rules regulating admission to the bar, and rules for the conduct of cases in and out of court. Consult: Holland, *The Elements of Jurisprudence* (ninth edition, London, 1900; first American edition, New York, 1896).

ADJU'DICA'TION (Lat. *adjudicare*, to adjudge). In the most general sense the judicial determination of a controversy. Specifically, in English and American law, the term is used to denote the final determination of a proceeding in bankruptcy. In the Federal Bankruptcy Act of 1898 it is defined as "a decree that the defendant, in a bankruptcy proceeding, is a bankrupt." The phrase "former adjudication" is often used, the rule being that persons shall not relitigate a matter which has been the subject of a former adjudication between them. See Judgment; Res Judicata; and the authorities there referred to.

ADJUST'MENT. In the law of insurance, the act of ascertaining the exact amount of indemnity which the party insured is entitled to receive under the policy, and of fixing the proportion of the loss to be borne by each underwriter. The nature and amount of damage being ascertained, an indorsement is made on the back of the policy, declaring the proportion of loss falling on each underwriter, and on this indorsement being signed by the underwriters the loss is said to have been adjusted. There has been some difference of opinion as to the nature of the obligation incurred by the underwriter upon agreeing to and subscribing to the adjustment; but it is now settled that the act is not absolutely conclusive upon him, but creates only a contract obligation, from which he may free himself upon proof of fraud, mistake, misrepresentation, etc. For the particular applications of the doctrine to marine insurance, where it is of most importance, see Average. Consult Arnould *On Marine Insurance* (London, 1901). See Insurance.

AD'JUTANT (Lat. *ad*, to + *jutare*, to assist, help). A staff officer. In the United States Army, generally a regimental officer of captain's rank appointed by the regimental commanding officer to assist him in the training, discipline, and duties of his command, together with the general supervision of its interior economy. Squadron or battalion adjutants, appointed from the lieutenants, have similar duties in a more limited degree and sphere. Post, garrison, artillery district, or brigade adjutants have similar relationship to their respective commanding officers. The duties of the position are practically the same throughout the armies of all the great powers. In the United States the regimental adjutant is appointed for a term of four years and the squadron or battalion adjutants two years. Such officers are not eligible for re-appointment. For a description of their duties, consult the United States Army Regulations.

ADJUTANT (For origin of name, see above). A large East Indian stork (*Leptoptilus argala*), about 5 feet high and 5 feet in length. It is chiefly white, but the back and wings are slate-colored, and the head and neck bare and flesh-colored, marked with black. From the front of the neck hangs a long pouch, which is connected with the respiratory system, and possibly serves as an air-reservoir under special conditions. "Adjutant" is really a nickname given to these birds, because of an absurd resemblance at certain times to a self-important army officer. The adjutant is very voracious, and though it is especially fond of fresh meat, its chief source of food is in carrion and offal. It is, therefore, an efficient scavenger, and since it also eats many of the smaller noxious animals, it is protected by law in India. Although so large a bird, its powers of flight are considerable, and it is said to soar to great heights, mingling with vultures in its search for food. The adjutant is found in India and southeastern Asia, a smaller species occurring in the East Indies. A closely allied species, the Marabou (q.v.), inhabits Africa. Both furnish the Marabou feathers of commerce, their lengthened under-tail and under-wing coverts being of unusual beauty.

AD'JUTANT-GEN'ERAL. A military staff officer, the chief assistant of a commanding general in the execution of his military duties, as in issuing and executing orders, receiving and registering reports, regulating details of the service, and so forth. In the United States Army all officers acting as above are known as *military secretaries* since the act of April 23, 1904. The military secretary is an important officer of the war department (see Army Organization), having the rank of major-general, his duties including also the management of the recruiting service, the collection of military information, the preparation of annual returns of the militia, etc. Most of the individual States also have adjutant-generals, performing similar duties with respect to the militia of their several States.

AD'LER (*Ger. pron.* äd'lẽr), Cyrus (1863—). Founder of the American Jewish Historical Society, was born at Van Buren, Ark., graduated at the University of Pennsylvania (1883), became associate in Semitic languages at Johns Hopkins, and in 1892 librarian of the Smithsonian Institution. As special commissioner for the World's Columbian Exposition at Chicago, he spent fifteen months in Egypt, Turkey, Servia, and Persia, in 1890-91, and obtained most of the Oriental collections for that exhibit. He is one of the editors of the Jewish Encyclopedia. He has published, among other works, *The Shofar, Its Use and Origin* (1893), and, with Allan Ramsay, *Told in the Coffee House* (1898), a series of folk tales collected in Constantinople.

ADLER, Felix (1851—). A German-American educator and reformer. He was born August 13, 1851, at Alzey, Germany, and came to the United States in 1857, where his father had been called to the ministry of Temple Emanu-El at New York. After graduating at Columbia College in 1870, he studied philosophy and economics at the universities of Berlin and Heidelberg, receiving the degree of Ph.D. in 1873. On his return to New York he was appointed professor of Hebrew and Oriental literature at Cornell University, and held this position from 1874 to 1876, when he organized at New York the Society for Ethical Culture (q.v.), with which his name has since been identified. Professor Adler is widely known as a lecturer and writer. His principal literary works are: *Creed and Deed* (New York, 1877); *The Moral Instruction of Children* (New York, 1898).

ADLER, Friedrich (1827—). A German architect and art historian. He was born at Berlin; studied at the architectural academy there and later traveled widely. He designed several church structures, including St. Thomas's at Berlin and St. Paul's at Bromberg. He has made extensive study of the architecture of ancient times and of the Middle Ages, and has taken an active interest in the excavations at Olympia. Besides contributions to official reports, he has published: *Mittelalterliche Backsteinbauwerke des preussischen Staats* (1859-69); *Die Baugeschichte von Berlin* (1861); *Baugeschichtliche Forschungen in Deutschland* (1870-79), and other works.

ADLER, Georg (1863—). A German economist and author, born at Posen. He lectured as extraordinary professor of sociology at the University of Basel, Switzerland, and afterward became professor of political economy in the University of Freiburg, Germany. His writings on economic and sociological questions, in which he usually advocates moderation as opposed to revolutionary agitation, include: *Karl Marxsche Kritik* (1886); *Internationaler Arbeiterschutz* (1888); *Social-Reform und Theater* (1891); *Staat und Arbeitslosigkeit* (1894); *Die Social-Reform im Altertum* (1898); *Geschichte des Socialismus und Communismus* (1900).

ADLER, George J. (1821-68). A German-American philologist. He was born in Germany, and at the age of twelve came to New York. He graduated at the University of New York in 1844, and in 1846 was appointed professor of German in that institution, which position he held until 1854. He is the author of the following works: *German-English Dictionary* (New York, 1848; frequently reprinted); *German Grammar* (New York, 1868); *Wilhelm von Humboldt's Linguistic Studies* (New York, 1868), and a translation of Fauriel's *History of Provençal Poetry* (New York, 1860).

ADLER, Hermann (1839—). Chief rabbi of the United Hebrew Congregations of the British Empire. He was born at Hanover, Germany, and was educated at London, Prague, and Leipzig, where he received the degree of Ph.D. in 1862. In 1863 he was appointed principal of the Jews' College, London, where, notwithstanding his appointment as minister of the Bayswater Synagogue in 1864, he remained as tutor of theology until 1879, and upon his unanimous election as chief rabbi of the United Congregations of the British Empire in 1891 he became president of the college. Afterward he became minister of the Cathedral Synagogue in Duke's Place. He has written many essays, such as *Ibn Gabirol and his Relations to Scholastic Philosophy* (University College Essays, 1864), and *Can Jews Be Patriots?* (a reply to Goldwin Smith, *Nineteenth Century*, 1878).

ADLER, Nathan Marcus (1803–90). Chief rabbi of the United Hebrew Congregations of the British Empire. He was born in Hanover, and educated at the universities of Göttingen, Erlangen, and Würzburg. He was appointed chief rabbi of Oldenburg (1830), of Hanover and the provinces a year later, and in 1844, chief rabbi of the British Empire. He was one of the organizers of Jewish schools in London and the provinces; he joined Sir Moses Montefiore in his appeal for the Holy Land, by which £20,000 was raised; was one of the founders of the "United Synagogue," and founder and first president of the Jews' College, London. He published several important Hebrew works, among them *Netinah la-Ger*, a commentary on the Targum of Onkelos, besides volumes of sermons, including *Sermons on the Jewish Faith*.

ADLER, Samuel (1809–91). A German-American rabbi and author, born at Worms, Germany. He studied at the universities of Bonn and Giessen, was rabbi of congregations in Alzey and vicinity (1842–57), and rabbi of the congregation Emanu-El of New York City (1857-74). He was a learned Talmudic scholar and an earnest progressionist. His works include *Jewish Conference Papers* (1880), *Benedictions* (1882), and *Kobez 'al Yad* (*Collections*, 1886).

ADLER, Victor (1852—). An Austrian Socialist leader, was born at Prague, and educated in the Vienna University. After visiting England, he wrote a book on factory inspection there. He founded at Vienna a Social Democratic weekly journal, which was suppressed by the government. Afterward he founded and became editor-in-chief of the *Arbeiter Zeitung*. His publications include *Die Arbeiter Kammern und die Arbeiter* (1886).

ADLERBERG, ăd′lẽr-bĕrk. Vladimir Fiodorovich, Count (1790–1884). A Russian statesman, born in St. Petersburg. In 1817 he was adjutant to the Grand Duke Nicholas, and later, for his devotion during the Decembrist revolution in 1825, became major-general, accompanying the Emperor during the Turkish campaign in 1828. Made postmaster-general in 1841, he distinguished himself by many reforms in the service. He was made general of infantry in 1843, count in 1847, and in 1852 minister of the imperial household, in constant attendance on the Emperor, and kept the position under Alexander II., retiring in 1872.

ADLERCREUTZ, ăd′lẽr-kroits, Karl Johan, Count (1757–1815). A Swedish general and statesman, born in Finland. He was defeated in Finland by the Russians in 1808 and his estates were confiscated. With Georg Adlersparre he brought about the overthrow of Gustavus IV., who was succeeded on the Swedish throne by Charles XIII. Later the two generals quarreled, and Adlersparre was disgraced, while Adlercreutz remained in favor.

ADLERSPARRE, ăd′lẽrs-pä′re, Georg, Count (1760–1835). A Swedish general and statesman; educated at the University of Upsala; entered the army, took part in the war against Russia in 1788 and in the campaigns against Norway. After the death of Gustavus III. he devoted himself to the study of political economy. He reëntered military service in 1808 and fought against Russia; and the next year joined with Adlercreutz in the movement to elevate Charles XIII. to the Swedish throne. In 1810, finding himself succeeded in the new king's favor by his rival Adlercreutz (q.v.), he withdrew from court. In 1831 he was fined for publishing secret State papers, including his correspondence with Charles XIII.

AD LIB′ITUM (Lat. at will, Ital. *a piacere*, *a piacimento*). In music, a term indicating that the part, accompaniment, embellishment, or instrument may be omitted at will. Thus, a song written with 'cello accompaniment *ad libitum* may be sung to the piano accompaniment alone or with the 'cello added. The term also denotes liberty in tempo and rhythm. See Accompaniment.

ADMEAS′UREMENT. See Measurement of Ships.

ADMEASUREMENT OF DOW′ER (Lat. *ad*, to + *measurement*). In English law, an ancient writ by which an heir could obtain redress against the widow of his ancestor in case the heir or his guardian had, during the heir's minority, assigned to her more land as her dower than she was entitled to. The writ has been superseded by simpler forms of action; but the remedy, often under the same title, still remains wherever the common law principle of dower (q.v.) is recognized. Consult: Scribner, *Treatise on the Law of Dower* (Philadelphia, 1883); and Roper, *Treatise on the Law of Property Arising from the Relation Between Husband and Wife* (Philadelphia, 1841).

ADME′TUS (Gk. Ἄδμητος, *Admētos*). A mythical king of Pheræ, in Thessaly. He was in the Calydonian hunt and the Argonautic expedition. By the aid of Apollo, who was his herdsman during a year of banishment from Olympus, he won Alcestis, daughter of Pelias. Apollo also procured him a prolongation of life, if another would die in his stead. Alcestis consented, but was sent back from the lower world by Persephone, or rescued by Hercules from death at the tomb itself. The story forms the subject of a celebrated drama by Euripides (q.v.). Compare Browning, *Balaustion's Adventure* (London, 1871).

AD′MI. Cuvier's gazelle. See Gazelle.

ADMIN′ISTRA′TION (Lat. *ad*, to + *ministrare*, to attend, manage). In general, the management or conduct of any business; especially, in politics, executive government. In its broadest sense, in public affairs, it means the full activity of the government engaged in the practical exercise of its authority in conformity with the constitution of the nation. But, usually, administration refers only to those functions of the government exercised through the executive and judicial departments, comprehending all the activities of the State except those relating to the making of laws by the legislature. The organization of administration may be divided into two kinds, centralized and localized. In small States the administrative system must necessarily have a municipal rather than a Federal character. Thus, in the States of ancient Greece and Rome and of mediæval Italy we find the system suited to the wants of a single town. When the State expanded beyond these dimensions, the municipality was transformed into a centralized form of government. Administration in American politics is a general term given to the Federal or a State executive government. Our national administration is composed of the President and his Cabinet. The term does not always cover the actions of the majority in the legislative branches, as frequently this majority is antagonistic to the administration. We speak of Washington's administration, meaning the Federal executive government during the time in which he was President; and of the policy, acts, omissions, errors, etc., of the administration of the nation or of any State. The supporters of the officials in power are called the administration party. The term is used in England and on the continent in somewhat similar manner, but in England, the administration, represented by the premier and his cabinet, is always composed of members of the party having the legislative majority. See Goodnow, *Principles of the Administrative Law of the United States* (New York, 1905).

Administration, In Law. A term applied to the management and disposal of a deceased person's estate. It includes payment of debts, getting in of credits and choses in action belonging to the deceased person, and the distribution of his personal estate to his legatees or next of kin. Anciently, the king as *parens patrii* administered decedent's estate through his officers. By the statute of Westminster II. this duty was delegated to the ordinary, and by later statute he was directed to grant administration to the husband or wife or next of kin of the decedent. To-day the jurisdiction over decedents' estates is committed in England to the Court of Probate, and in the United States to courts variously known as probate courts, surrogates' courts, and orphans' courts. The officer of administration, if appointed by will, is called an executor; if not nominated by will and appointed by the court having jurisdiction over decedent's estates, he is called an administrator. An administrator may be *temporary,* when he is appointed pending litigation upon the question as to who is entitled to administer upon the estate; or *with the will annexed,* when the will failed to name an executor, or the executor named fails to qualify for his office; or *de bonis non,* that is, to administer upon the goods not administered by a prior administrator, who no longer retains his office because of death or removal. Administration may also be ancillary, in which case the officer of the administration is said to be an ancillary executor or administrator. The distinction is a consequence of the rule that the place of administration is the domicile of the decedent, and that the administrative officer has no authority outside the jurisdiction where he is appointed or confirmed. Thus, when a decedent leaves property in two jurisdictions, his estate should be administered in the jurisdiction of his domicile, and the administrative officer, in order to act in the other jurisdiction, should obtain an appointment ancillary to his appointment in the domiciliary jurisdiction. It is then his duty to transmit the assets to the jurisdiction of domicile, to be there administered. By the canon law, the administrator or executor becomes vested with title to the decedent's personal property. This is still the rule by statute in most jurisdictions. In addition to the duties already referred to, special duties might be imposed upon an executor by the will. In most jurisdictions the administrator, and in some the executor, is required to give a bond for the faithful performance of his duties. He remains bound on his obligation, and subject to the direction of the court, until his final accounting and discharge by order of the court. See Schouler, *Treatise on the Law of Executors and Administrators,* third edition (Boston, 1901); Woerner, *Treatise on the American Law of Administration,* second edition (Boston, 1899); Williams, *Treatise on the Law of Legal Representatives* (London, 1899).

ADMINISTRATION, Military. A form of government which takes the place of the civil governing powers in regions placed under martial law. The city of Paris, during the war with Germany, 1870-71, and Cape Colony, South Africa, during the recent Boer War, are cases in point. See Martial Law.

ADMIN'ISTRA'TIVE LAW. That part of the law which regulates the enforcement of the will of the State as expressed by the authorities which are permitted by the governmental system to express that will, particularly the legislature. Since it is necessary under all governmental systems that authorities be formed for the purpose of enforcing the law, administrative law treats, in the first place, of the organization of the administrative authorities. This portion of the administrative law determines the organization of the administrative authorities, both those having jurisdiction over the entire State (who are known as central administrative authorities), and those having jurisdiction over only a portion of the State, who are known as local authorities. In the United States, e.g., the administrative law treats: of the President; the heads of the Federal executive departments and their subordinates (both at Washington and in the districts into which the country is divided for purposes of Federal administration, such as the customs and internal revenue districts); the State governor and State officers generally; or the county, town, and city officers. Since no administrative officer may legally take any action which he is not authorized by the law to take, the administrative law treats, in the second place, of the powers and duties of administrative officers; in other words, of administrative functions. Finally, since there is no use in delimiting by law the powers and duties of administrative officers, unless some means is provided of preventing them from exceeding their powers and forcing them to perform their duties, administrative law treats of the remedies afforded in case of an excess of power or violation of duty. American administrative law thus embraces certain well defined minor branches of the American law, such as the law of officers, the law of municipal corporations, the law of taxation, the law of public nuisances (whether common law or statutory), the law of extraordinary legal remedies (such as mandamus, prohibition, certiorari, quo warranto, and habeas corpus), as well as the law of equitable remedies, so far as they are applicable to public authorities.

Bibliography. Goodnow, *Comparative Administrative Law* (2 volumes, New York, 1893), and *Administrative Law of the United States* (New York, 1905); Mechem, *Law of Offices and Officers* (New York, 1890); Dillon, *Law of Municipal Corporations* (Boston, 1881); Cooley, *Law of Taxation* (Chicago, 1883); Prentice, *Police Powers* (New York, 1894); High, *Extraordinary Legal Remedies* (Chicago, 1884).

AD′MIRABLE CRICH′TON, krī′ton. See Crichton, James.

AD′MIRABLE DOC′TOR. A translation of the Latin, *Doctor Admirabilis*, a title given to Friar Roger Bacon (1214-94) on account of his extensive knowledge.

AD′MIRAL. The title of a naval officer of the highest rank. The word is derived from the Arabic *amīr*, or *amīr al-* (lord, or chief of the), forming the first part of many compound words, such as *amīr al-mu'minīn*, "commander of the faithful;" *amīr al-umarā*, "commander of the forces;" *amīr al-bahr*, "commander of the sea;" *amīr al-umarā 'asākir*, "commander of the troops, marshal." The term appears to have been introduced into Europe during the Crusades, and to have been first used in a definite sense by the Sicilians and afterwards by the Genoese. In French the word is preserved without change, as *amiral;* in Spanish and Portuguese it has developed into *almirante*, and, in Italian, into *ammiraglio*. The early English form was doubtless similar to that of the French, as we find it spelled *amyrell* and *admyrall*. It was Latinized in England as *admiralius*, and as early as the time of Edward III. was Anglicized as *admyrall*. The first English "admiral of the seas" of whom there is any record was William de Leybourne, 1297. His office, however, was not that of a commander of sea forces, but embraced those general and extensive powers afterwards associated with the title of lord high admiral of England; that is, both the administrative functions now vested in the lords commissioners of the admiralty (five in number) and the judicial authority belonging to the present high court of admiralty. The office of lord high admiral was last filled by the Duke of Clarence, afterward William IV. Upon his resignation in 1828 it was put in commission, reverting to a previous practice. The duties of the office were administered by a board of commissioners from 1632 to about 1650, from 1685 to 1702, and from 1708 to 1827, while under the commonwealth they were performed by a committee of Parliament.

In the United States Navy the grades of admiral, vice-admiral, and rear-admiral were established by act of Congress, primarily for the purpose of conferring exceptional distinction upon the great naval commander Captain David Glasgow Farragut (q.v.). The lowest of these grades, that of rear-admiral, was established in 1862, as was also that of commodore; though the latter had previously existed as a courtesy title without authority of law. The number of rear-admirals on the active list was limited to nine. In 1864 the President was authorized to appoint one of the rear-admirals a vice-admiral. Under the laws, Captain Farragut became the first commodore, first rear-admiral, and first vice-admiral. In 1866 Congress provided for an active list of one admiral, one vice-admiral and ten rear-admirals. Farragut was promoted to be admiral, and Rear-Admiral David D. Porter to be vice-admiral. On the death of Farragut (1870), Porter became admiral and Rear-Admiral Stephen Clegg Rowan was promoted to be vice-admiral. With the death of Porter (1891) and Rowan (1890), the grades of admiral and vice-admiral became extinct. In 1899 the grade of admiral was reëstablished, and Rear-Admiral George Dewey was promoted to fill the vacancy in recognition of his services in the battle of Manila Bay, and of his judicious management of the difficult international situation following the defeat and destruction of the Spanish fleet. In 1882 Congress reduced the number of rear-admirals on the active list to six and the number of commodores to ten; but in 1899 the number of rear-admirals was increased to eighteen and the grade of commodore on the active list abolished. In addition, the chiefs of the bureaus of the navy department have the rank of rear-admiral during their term of office. Under the original act of Congress (November 15, 1776), looking to the establishment of the ranks of admiral, vice-admiral, and rear-admiral, the first named ranked with the general of the army, the second with a lieutenant-general, and the last with a major-general. Since 1862 various acts have confirmed these provisions; but the act of 1899, which abolished the rank of commodore, provided that the first nine rear-admirals should rank with major-generals and the second nine with brigadier-generals. The act of 1899 fixed the pay of flag officers as follows: Admiral, $13,500 at sea or on shore; senior nine rear-admirals, $7500 while at sea, or on shore duty beyond seas, and $6375 while on shore duty; junior nine rear-admirals, $5500 while at sea, or on shore duty beyond seas, and $4675 while on shore duty. The pay of officers on the retired list is seventy-five per centum of their active pay at time of retirement. The number in 1902 on this list was forty-three. The flag of the admiral is a rectangular blue flag with four white stars, and is flown at the main; that of the vice-admiral, flown at the fore, is a similar flag, with three stars. The flag of a rear-admiral, flown at the mizzen, is similar in shape, has two stars, and is usually blue in color, but in case two or more rear-admirals are in company the senior flies a blue flag, the second in rank a red flag, and the junior a white flag. For illustration see Plate of United States Flags accompanying Flag.

In the British Navy the admirals are distinguished into three classes: Admirals, vice-admirals, and rear-admirals; the admiral carrying his colors at the main, the vice-admiral at the fore, and the rear-admiral at the mizzen-masthead. In former times each grade was subdivided into three sections, known as admirals (or vice or rear admirals) of the red, of the white, and of the blue, respectively. The flag hoisted by the admiral (thence called a flag officer) agreed in color with his section; and all the ships under his command carried ensign and pennant of the same hue; but the distinction was otherwise without practical effect and is now abolished. Admiral of the fleet is a higher rank, conferred at the will of the sovereign. The rates of full or sea pay of flag officers are as follows:

Admiral of the fleet, per day, £6; admiral, £5; vice-admiral, £4; rear-admiral, £3. An admiral commanding-in-chief receives £3 a day additional at home and £4 10s. abroad, as table money. In 1906 there were eighty-seven flag officers on the active list in the British Navy: viz., five admirals of the fleet, eleven admirals, twenty-three vice-admirals, and forty-eight rear-admirals; and on retired and reserved pay, five admirals of the fleet, eighty-six admirals, forty-nine vice-admirals, and eighty-six rear-admirals. The admiral of the fleet takes rank with a field marshal. admirals with generals, vice-admirals with lieutenant-generals, and rear-admirals with major-generals.

ADMIRAL. 1. In entomology, any of several nymphalid butterflies, ordinarily the "red" admiral (*Pyrameis atalanta*), common throughout North America, Europe, northern Asia, and Africa. It has an expanse of about 2½ inches, and is brown, the hinder wings broadly margined with red, including a row of four dark dots; the same color forms a curved diagonal band across the fore wings, beyond which the angle of the wing is spotted with white and edged with purple. (See Plate of AMERICAN BUTTERFLIES.) The caterpillar is 1⅛ inches long, brown and spinous; the chrysalis is brown, naked, and suspended to the food-plant upon which the larva has fed, usually some species of nettle, hop, or related plant. Butterflies of the related genus Basilarchia are called white admirals.

2. In conchology, a cone (*Conus ammiralis*) whose shell was formerly rare and valuable.

AD'MIRALTY, THE. In England, the state department which exercises the administrative functions of the lord high admiral, and which, accordingly, has the management of all matters concerning the British Navy and the royal marines. These functions of the lord high admiral have been transferred to and vested in a board of commissioners. (See ADMIRAL.) The constitution and functions of this body will now be described.

The board of admiralty, as at present constituted, comprises five lords commissioners of the admiralty, who decide collectively on all important questions. Besides this collective or corporate action, each commissioner has special duties assigned to him. There are two civil or political lords, and three naval or sea lords. The first lord, who is always a cabinet minister, besides a general control, has the management of naval estimates, finance, political affairs, slave-trade prevention, appointments, and promotions. The first naval lord manages the composition and distribution of the fleet, naval discipline, appointment of inferior officers, commissioning ships, general instructions, sailing orders, and the naval reserve. The second naval lord attends to armaments, manning the navy, the coast-guard. the marines, marine artillery, and naval apprentices. The third naval lord has control over the purchase and disposal of stores, victualing ships, navy medical affairs, transports, convicts, and pensioners. The junior civil lord attends to accounts, mail-packets, Greenwich hospital, naval chaplains, and schools. Naval architecture, the building and repairing of ships, steam machinery, and new inventions are superintended by the Comptroller of the Navy, who is not a member of the board, but is directly responsible to the first lord. Under the lords are the first secretary (parliamentary), the second secretary (permanent), and the naval secretary (professional), who manage the daily office work. The lords all resign when the prime minister resigns, and those who have seats in Parliament are replaced by others.

ADMIRALTY INLET. The central and main passage of Puget Sound (q.v.), forming in its southern part the eastern branch of the arm of the sea which here penetrates the State of Washington. The width varies from one to ten miles, and the channel is obstructed by relatively few islands. The coast line is marked by a succession of projecting points of land and receding minor inlets, which render the form as a whole exceedingly irregular. Seattle, Tacoma, and Port Townsend are the chief cities on the Inlet. The channel has usually a depth of several hundred feet, and thus offers valuable facilities for transportation.

ADMIRALTY ISLAND (Map: Alaska, J 4). An island about 80 miles long, well wooded and watered, included in Alaska (q.v.).

ADMIRALTY ISLANDS. A group of about 40 islands, constituting a part of the Bismarck Archipelago (q.v.), lying to the northeast of New Guinea, between 2° and 3° S. lat. and 146° 18′ and 147° 46′ E. long. (Map: East India Islands, L 5). The largest is about 50 miles long from east to west, and is covered with rich vegetation. They abound in cocoanut trees and are inhabited by savages. They were discovered by the Dutch in 1616 and became a German protectorate in 1885.

ADMIRALTY LAW. The system of law and procedure relating to maritime transactions. It owes its name to the fact that originally it was administered in England by the lord high admiral. Not only its rules of substantive law but its procedure were adopted from the civil law, and from such sea codes as those of Rhodes (q.v.) and Oléron (q.v.). This fact, and its adaptability to new causes of action, which led suitors to resort to the admiralty rather than to the common law courts, aroused the hostility of the common law bench and bar. The contest between the partisans of the two systems which followed resulted in contracting the jurisdiction of English admiralty courts to very narrow limits. Modern statutes have extended it, and have also made the Court of Admiralty a part of the High Court of Justice, forming it, with the courts of probate and divorce, into the probate, divorce, and admiralty division. At present the ordinary jurisdiction of English admiralty courts embraces actions to recover possession of a ship, to recover damages for injuries to shipping, to recover seamen's wages, for salvage, for necessaries supplied to a ship, for bottomry, respondentia, and mortgage, for pilotage and towage, for restoration of goods taken by pirates, and for assaults or batteries on the high seas.

By the United States constitution (Article III., § 2), the cognizance of "all cases of admiralty and maritime jurisdiction" is granted to the Federal judiciary. The limits of this grant of judicial authority were in doubt for many years. On the one hand it was insisted that the admiralty jurisdiction of the Federal courts was confined to the cases cognizable by the English admiralty when our States separated from the mother country. On the other hand, it was argued that the broad language of the constitution extended this jurisdiction to all cases of maritime law. The latter view has prevailed, and to-day the Federal courts of admiralty have cognizance of all maritime cases arising, not only on the high seas and great lakes, but on almost all navigable rivers and canals within the United States. While the United States have no court whose duties and jurisdiction are confined to admiralty cases, the district courts possess exclusive original jurisdiction over all admiralty and maritime cases. From their final decisions appeals may be taken to the Circuit Court of Appeals and to the Supreme Court. The Federal courts sitting in admiralty have criminal as well as civil jurisdiction; but their practice in criminal cases is similar to that of common law courts, including trial by jury. The State courts of this country have no admiralty jurisdiction. Consult: Benedict, *The American Admiralty, Its Jurisdiction and Practice* (Albany, 1900); and Roscoe, *Treatise on the Jurisdiction and Practice of the Admiralty Division of the High Court of Justice* (London, 1882).

ADMIRALTY SOUND. A southern extension of the Strait of Magellan near its middle part, penetrating Tierra del Fuego to a distance of nearly 100 miles. Its mouth is partially blocked by Dawson Island. In the last 50 miles of its extent its width varies from 5 to 10 miles. The coast land is elevated.

ADMIS'SION. In the law of evidence, a confession or acknowledgment of a party to an action, made at any time, as to the existence of a fact in issue. An admission is valid evidence against the party making it at the trial of the action, but, on the other hand, is never permitted to operate in his favor. The competency of this class of evidence constitutes a well settled exception to the so-called "hearsay evidence" rule, that statements not made under oath and not subjected to the test of cross-examination at the trial shall not be permitted to be given in evidence. While admissions admissible in evidence are most frequently made by a party to the action, they may be made by one acting by his authority or by one identical in interest with him. Thus, admissions made by an agent, or servant, or by the husband or wife of a party, will be received in evidence against him if actually or impliedly authorized by him. Admissions made by one claiming under the same title or interest as the party are also admissible in evidence against him. For example, admissions made by a deceased person during his lifetime are admissible against his executor or administrator, and admissions made by the owner of real estate with reference to his title are competent evidence against his grantee, when the grantee is a party to an action in which his title is in issue. In England the doctrine of admissions made with reference to title to real property has been extended to apply to cases of admissions made with reference to title of personal property and negotiable paper indorsed before due; but in the United States the tendency has been to limit the application of the rule to admissions made with reference to real property.

In criminal law admissions of guilt by one accused of a crime are technically known as *confessions*. At common law confessions were held not to be competent evidence against the prisoner when obtained by threats or promise of favor, and modern statutes have generally still further limited the admissibility of confessions in criminal cases.

Admission should be distinguished from *admission against interest*, a term which embraces a distinct class of evidence. Admissions against interest are written statements or book entries made by one against his financial or proprietary interest, and are admissible in evidence in any action in which the truth of the matter stated in the admissions is in issue, provided the person making the admission be dead at the time it is offered in evidence. The person making the statement need not represent or be in privity with a party to the action or have acted by his authority. See the works referred to under EVIDENCE.

AD'MONI'TIONISTS. A name applied to the partisans of *An Admonition to the Parliament*, published in 1572 by two Puritan clergymen, and of the *Second Admonition to the Parliament*, by Thomas Cartwright (q.v.), the leader of the sect.

ADOBE, ȧ-dō'bȧ (Spanish). A Spanish-American name applied to sun-dried bricks made from any suitable material which becomes hardened on exposure to the sun. Such bricks, employed largely in the arid and semi-arid districts of North America, are usually made in two sizes, the approximate dimensions of which are 18 by 9 by 4 inches, and 16 by 12 by 4 inches. Those of the latter size when laid alone are used as "headers," i.e., with the greatest dimension crosswise to the length of the wall, though a much stronger wall results from a combination of the larger size as headers, with the smaller as "stretchers," or lengthwise to the direction of the wall. The process of baking consists in first exposing the newly molded adobes to the direct rays of the sun for a day, then turning them for exposure of the under face and continuing the exposure for from seven to fourteen days, eventually stacking the finished product under cover till required for use. Because of the lack of coherency, adobes can be employed only in regions of limited rainfall. Many of the bricks made in ancient Egypt, Assyria, and Babylonia were made of clay mixed with straw and baked in the sun.

ADOBE SOIL. A term applied to certain clay soils in the southwestern portions of the United States, which, when moist, are of exceeding plasticity, and when dry are of such coherency as to prohibit easy tillage. These soils may be rendered tillable and very fertile by plowing into the moist clay considerable quantities of sand loam. See CLAY and BRICK.

ADOLESCENCE. The period of life extending from puberty (q.v.) to the age of 21 in females and 25 in males. It is marked by active growth, especially in the osseous and muscular systems, and certain vascular tissues. The reproductive organs reach their full maturity during the latter part of the period, at which time there is a partial cessation of the exaggerated nutritive activity prevailing throughout the earlier part. During adolescence the mind becomes conscious of new capabilities; self-assurance and constructive and originating tendencies become apparent. In the boy, extravagant plans, conceit, and egoism are prominent characteristics; in the girl idealizing, reverie, and romantic imagination. It is apparent that the sexual and mental development occurring during this period render proper training and influence during adolescence of the utmost importance. Consult: Hall, *Adolescence*, 2 volumes (New York, 1904).

ADOLF, King of Germany. See ADOLPHUS.

ADOLF, ä'dôlf, I. (?-1220). Archbishop of Cologne from 1194 to 1205. He was one of the foremost opponents of the Hohenstaufen dynasty, and despite his oath of fealty to Frederick II., and in defiance of the will of the majority, he nominated Otto IV. of Brunswick, and crowned him at Aix-la-Chapelle, June 9, 1198. He forestalled the papal influence upon the imperial election, and when finally Otto revealed his inability to protect his adherents against Philip of Swabia, Adolf crowned his opponent (1205). He was excommunicated, and deposed in 1205.

ADOLF I. (1353–90). Archbishop of Mainz. In 1371 he was appointed Bishop of Speyer, and two years later, after the death of his rival, John, succeeded to the see of Mainz. When, at the instigation of Charles IV., and with the consent of the Pope, the Landgrave of Thuringia sought to bring about his deposition, Adolf firmly maintained his ground, and upon the outbreak of a schism in the Church obtained the papal sanction of Clement VII. (Antipope) and Urban VI.

ADOLF, WILHELM AUGUST KARL FRIEDRICH (1817–1905). Grand Duke of Luxemburg, previously Duke of Nassau, the eldest son of Duke William of Nassau by his first wife, Princess Louise of Saxe-Hildburghausen. He succeeded his father, as Duke of Nassau, August 20, 1839. His anti-progressive policy led in 1848 to a revolt which, however, was speedily suppressed. In the first Schleswig-Holstein War he commanded a brigade of German troops. In the war of 1866, he sided with Austria, and as a result was deprived of his territory. During the illness of King William III. of the Netherlands, Adolf, as next of kin, succeeded as Grand Duke of Luxemburg, the ruler of which he became upon the death of William III. (November 23, 1890). He died November 17, 1905, and was succeeded by his son Wilhelm Alexander (born 1852).

ADOLPHE, à'dôlf'. An important novel by Benjamin Constant de Rebecque, published in 1816. In the hero, Adolphe, is found a realistic presentation of the author's sentimental experience with Madame de Staël.

ADOL'PHUS, or **ADOLPH**, OF NASSAU (1250–98). King of Germany. He was the son of Walram, Count of Nassau. He was elected to succeed Rudolph of Hapsburg, and was crowned King of the Romans (June 24, 1292). Adolphus agreed to assist England in her war with France for a large subsidy, but failed to fulfill his agreement. For certain high-handed acts he was summoned before the college of electoral princes. He refused to appear, and was formally deposed in June, 1298, the crown being transferred to Rudolph's son, Albert. Adolphus took the field, and was killed in the first battle. Consult: Preger, *Albrecht von Oesterreich und Adolf von Nassau* (Leipzig, 1869).

ADOLPHUS FREDERICK (1710-71). Duke of Holstein-Gottorp, and, later, King of Sweden. He was elected successor to the Swedish throne in 1743, and became king in 1751, but the royal authority was so circumscribed by the council of the states that he was only a nominal king. In 1769 he offered to resign, but, on some concessions by the nobles, was induced to retain the throne till his death, when his son, Gustavus III., succeeded him.

ADOLPHUS, JOHN (1768-1845). An English historian and lawyer, born in London. He was celebrated in criminal practice, and gained much credit in the defense of Arthur Thistlewood, charged with treason in the Cato Street conspiracy in London, 1820. His best known work is the *History of England from the Accession of George III.* (7 volumes, 1802-45).

ADONAI, ăd'ô-nā'ī *or* à-dō'nī (Heb. lord, or my lord, in the sense of master). A term adopted in the Old Testament as the conventional pronunciation of the name of God, which is written with four consonants, Y H W H, and which was probably read Yahweh. See JEHOVAH.

ADO'NAI. See ADONIS.

AD'ONA'IS. The title of an elegy written by Shelley in 1821 upon the death of the poet Keats, who is therein likened to Adonis in his untimely end.

AD'ONA'I SHO'MO. See COMMUNISTIC SOCIETIES.

ADO'NI BE'ZEK. See ADONI-ZEDEK.

ADON'IC VERSE. A dactyl and spondee (—⏑⏑|——), or dactyl and trochee (—⏑⏑|—⏑|), adapted to light, lively versification, as in the famous hymn:

"Plaudite cœli;
Rideat æther," etc.

ADONIJAH, ăd'ô-nī'jà (Heb. Yahweh is Lord). A son of David and Haggith (I. Kings ii : 21), born at Hebron. After Absalom's death he was the natural heir to the throne, and was supported by Joab and Abiathar. He called together his sympathizers at a sacred stone near Jerusalem (I. Kings i : 9), but Benaiah, the captain of the bodyguard, Zadok, the priest, and Nathan, the prophet, succeeded by the aid of Bathsheba in getting the king's consent to the immediate enthronement of Solomon. Adonijah sought refuge at the horns of the altar. Solomon saved his life; but when he afterward demanded Abishag, David's concubine, for a wife, it was considered a plot for the throne, and Solomon ordered Benaiah to kill him.

ADO'NIS (Gk. Ἄδωνις). A youthful hunter, beloved by Aphrodíte, but slain by a boar sent, according to one version, by the jealous Ares. Aphrodite descended to the lower world and won from Persephone permission for her favorite to return to the light for a time every year. Another and seemingly older myth makes Aphrodite and Persephone quarrel for the possession of the beautiful infant. Zeus finally decided that he should spend four months with each of the goddesses and four months as he chose. The legends about Adonis have sprung from the rites of the Adonia, a festival celebrated in midsummer. On one day the loving union of Aphrodite and Adonis was represented, and on the other the sorrow caused by his death. All the funeral rites were performed by women about little images of Adonis. A special feature was the "gardens of Adonis," potsherds filled with earth, in which quick-growing plants, such as lettuce and fennel, were sown. After the burial these were thrown into springs. The Adonia was a woman's festival, and seems to have been celebrated chiefly by courtesans and others associated in the worship of Aphrodite. It is obviously the worship of a spirit of vegetation, who is believed to have a short life, die, and then rise again to renewed life for a season. Similar rites were widely spread, and in Phœnicia were associated with Thammuz. The theory that the name and worship of Adonis are Semitic is not proved, though there can be no doubt that the form of the earlier Greek cult was powerfully influenced by the ecstatic and orgiastic rites of the eastern Mediterranean peoples.

ADONIS. A genus of plants of the natural order Ranunculaceæ. The species are all herbaceous—some of them annual and some perennial. Several are natives of Europe, but only one, Adonis autumnalis, sometimes called Pheasant's Eye, is a doubtful native of Great Britain, where it occurs as a weed in wheat fields. It has become sparingly naturalized in several places in the United States. Its bright scarlet petals have obtained for it the name of Flos Adonis, their color having been fancifully ascribed to their being stained with the blood of Adonis. It is a well-known ornament of our gardens, in which also Adonis æstivalis frequently appears, and Adonis vernalis, a perennial species common upon the lower hills of the middle and south of Germany, with early and beautiful flowers.

ADO'NI-ZE'DEK (Heb., Zedek is lord). A king of Jerusalem who opposed resistance to the invasion of southern Palestine by tribes afterward forming a part of the kingdom of Judah about the beginning of the twelfth century B.C. Zedek was a god worshiped in Syria and southern Arabia. The account in Judges i. is more credible than that in Joshua x. Adoni-bezek is probably a scribal error for Adoni-zedek. No place called Bezek has been found, and "Lord of Bezek" would not be a natural name. No god by the name of Bezek is known. On the other hand, Adoni-zedek reminds one strongly of Melchizedek, "Zedek is king," another ruler of Jerusalem (Genesis xiv).

ADOP'TIAN CON'TROVERSY, The. An echo of the Arian controversy. It originated toward the end of the eighth century in Spain, the country in which the doctrine of Arius had longest held out. Elipandus, Archbishop of Toledo, and Felix, the learned bishop of Urgel, advanced the opinion that Christ, in respect of his divine nature, was doubtless by nature and generation the Son of God; but that as to his human nature, he must be considered as only declared and "adopted" through the divine grace to be the first-born son of God (Romans viii : 29), just as all holy men are to be adopted as sons of God, although in a less lofty sense. The flame of controversy thus kindled spread into the Frankish Empire, the special domain of "Catholic" Christianity, and gave occasion to two synods, one held at Ratisbon (792), and another at Frankfort (794), in which Charlemagne took part in person, and which condemned Adoptianism as heresy. The Catholic doctrine of the unity of the two natures of Christ in one divine person and the consequent impossibility of there being a twofold Son—an original and an adopted—was upheld by Alcuin and the other learned men of Charlemagne's court. At the synod of Aix-la-Chapelle (799), Felix, yielding to compulsion, recanted his opinions, without, as it would seem, being convinced. Elipandus adhered fanatically to his views, which were in after times defended by Folmar (1160), Durandus (died 1334), and the Protestant divine Calixtus (died 1656). Adoptianism has been erroneously attributed to Duns Scotus.

ADOP'TION (Lat. *adoptio*, a taking or receiving of one in place of a child, from *ad*, to + *optare*, to choose, select). A legal institution of much importance in early society, because of the importance attached to the perpetuation of household worship (particularly the worship of deceased ancestors); also because before the introduction of testaments an heir could be created only by adoption. In Roman law there were two forms of adoption: viz., *adrogation* and *adoption* in the strict sense. Adrogation was the earlier form. It was possible only where the person to be adopted was an independent person (*sui juris*), i.e., was not under the authority of a father or grandfather. It took place originally in the patrician assembly (*comitia curiata*) with the coöperation of the pontifices. Under the emperors it was effected by an imperial rescript. Adoption in the strict sense was the transfer of a person from the authority of his father or grandfather into the paternal authority of the adoptive father. It was accomplished by formal acts in the presence of a magistrate. It was usually requisite, alike in adrogation and adoption, that the adoptive father should have no children at the time, and no reasonable prospect of having any. He was also required to be eighteen years older than the person adopted. Females could not be adrogated, nor, until the third century, could they adrogate. They could be adopted, but they could not adopt. The effect of adrogation was to place the adopted person in the same legal position for nearly all purposes as a child born in wedlock. The same results originally attached to adoption, but Justinian introduced important restrictions. Adoption was unknown to the law of the Teutonic nations; and though most of the States of the Continent have borrowed it, with some modifications, from the Roman law, it has never existed as an institution in England or Scotland, either at common law or by statute.

As English common law made no provision for the adoption of children, the subject is regulated by statute in many States of the United States. While State legislation upon this topic differs in detail, its characteristic features are as follows: Any inhabitant of the State, of legal age, and competent to contract, may adopt a child, provided that the spouse of a married adopter, the living parents of the adopted, and the child, also, if above a certain age (usually twelve or fourteen years), consent in writing to the adoption. In some States the transaction is consummated by an order of court, in others by a deed duly acknowledged and recorded. As the claims of an adopted child are in derogation of the common law rights of the heirs and next of kin of the adopter, our courts are disposed to put a strict construction on these statutes, and to treat as invalid an adoption which has not been made in a manner which conforms to every statutory requirement. As a rule, the legal relation between adopting parents and adopted children is that of natural parent and child, including the powers of parental control, the duties of filial obedience, and reciprocal property rights by inheritance. In a few States, however, the adopting parent does not inherit from the adopted child. Consult: Stimson, *American Statute Law* (Boston, 1886); Schouler, *Treatise on the Law of Domestic Relations* (Boston, 1900); Woodruff, *Selection of Cases on Domestic Relations and the Law of Persons* (New York, 1897); and see PARENT AND CHILD.

AD'ORA'TION. A term originally applied among the Romans to an act of homage or worship performed by raising the hand to the mouth (Lat. *ad os*, whence the word), kissing it, and then waving it toward the object of reverence. It was natural to extend to great men the formal adoration at first paid only to deities, and the Roman emperors were saluted by bowing or kneeling, touching the imperial robe, and kissing the hand that did so. In eastern countries the form of adoration was to fall on the knees at a prince's feet, strike the forehead on the ground, and kiss the floor. On the same principle it may be said that the modern practice of kissing a sovereign's hand is a form of adoration; and similarly the custom at Rome of kissing the cross embroidered on the Pope's slipper. While the term adoration is very generally employed nowadays to express a mental attitude toward God, it may be well to remember that both it and the similar term worship had a much more limited sense: thus, in the English marriage service the bridegroom says to the bride: "With my body I thee worship and with all my worldly goods I thee endow." Thus, too, as a matter of theological terms, the Roman Catholic Church makes a distinction between *latria*, the worship due to God alone, and *dulia*, that given to the angels and saints.

ADORATION OF THE IMMAC'ULATE LAMB, THE. A celebrated altar painting in the cathedral of Ghent, Belgium, by the Flemish artists Hubert and Jan van Eyck. It represents Christ surrounded by the saints, and on the lower panels the sacrifice of the lamb.

ADORATION OF THE MA'GI. The worship of the infant Christ by the wise men, a frequent subject in religious art. Among the well known works with this title are pictures by the following artists:

Giovanni Bellini, in the National Gallery, London.

Sandro Botticelli, a painting on wood (date about 1480) in the Uffizi Gallery, Florence. His three wise men have the faces of Cosimo, Giuliano, and Giovanni de' Medici.

Albert Dürer (1504), also in the Uffizi.

Domenico Ghirlandajo, in the church of Santa Maria degli Innocenti, Florence (1488), and another, on wood, in the Uffizi (1487).

Vittore Pisano, in the Berlin Gallery.

Rembrandt (1657), in Buckingham Palace, London.

Rubens, who produced a number of paintings of this subject, for various churches, the magnificence of costume which it permitted in the three kings being well suited to his taste. Notable among them is the one now in the museum at Brussels, representing the child as held erect by his mother. Others are in the Antwerp museum and in the Louvre, Paris.

Il Sodoma (Giovanni Antonia Bazzi), an altar piece in the church of San Agostino, at Siena.

Stephan Lochner, in his famous triptych, the "Dombild," in the cathedral of Cologne.

Tintoretto, in the Scuola di San Rocco, Venice, a picture especially praised by Ruskin.

Paolo Veronese (Cagliari), by whom there are paintings with this title in the National Gallery, London, in the Brera, Milan, and notably one in the gallery at Dresden.

ADOUR, ȧ'dōōr'. A river in France, rising near Tourmalet, in the department of Hautes-Pyrénées (Map: France, E 8). It flows through the department of Gers and the fertile part of the department of Landes, and enters the Atlantic below Bayonne, after a course of 200 miles. It receives several tributaries, and is navigable to the extent of 80 miles. Bagnères-de-Bigorre, celebrated for its hot baths, is situated on the Adour.

ADOWA, ä'dō-ȧ, or **ADUA**, ä'dōō-ȧ. The capital of the Abyssinian province of Tigré, situated in 14° 12′ N. lat. and 39° 3′ E. long. (Map: Africa, H 3). It has an excellent climate on account of its elevated location, and was, prior to the Italian campaign of 1896, one of the best built cities of Abyssinia. At present a considerable part of it is in ruins, but it will probably be soon restored to its former condition, as the town is an important commercial centre and is on the route of the proposed railway line from Massowah to Gondar. Its population was formerly about 3000, but is probably less now. Adowa was the scene of the defeat of the Italian troops under General Baratieri by the Abyssinians on March 1, 1896. Consult: Setetin, "La bataille d'Adoua: Etude tactique," in volumes IX. and X., *Journals des Sciences Militaires* (Paris, 1901).

ADRA, ä'drȧ. A seaport town of Spain, in the province of Granada, 49 miles southeast of Granada. It is situated on the shore of the Mediterranean, at the mouth of the Adra (Map: Spain, D 4). The ancient Abdera, founded by the Phœnicians, was on a hill, at the base of which the modern town stands, in a situation unhealthful on account of swamps. The port is not good, being much exposed to the wind. Lead mines in the neighborhood give employment to many of the inhabitants and trade to the port. Among other exports are grapes, wheat, and sugar. Pop., 1900, 11,246.

ADRAIN', ROBERT (1775-1843). An Irish-American mathematician, born at Carrickfergus. During the Irish rebellion of 1798 he was wounded and escaped to America, where he became a teacher of mathematics and occupied chairs at Rutgers (1810-13), Columbia (1813-25), and the University of Pennsylvania (1827-34). He was editor of the *Mathematical Diary* (1825-29), and prepared an edition of Hutton's *Mathematics*. His original work includes papers on the shape and size of the earth and on gravity.

ADRAM'MELECH (Babyl. *Adar-malik*, Adar is king). 1. A god worshiped by the inhabitants of Sepharvaim after they had been deported to Samaria by Sargon (II. Kings xvii : 24, 31). Sepharvaim has been supposed to be the Babylonian Sippar, and Adrammelech a divinity Adar-malik. But Sepharvaim is more likely to be the Shabara'in of the Babylonian chronicle, the Sibraim of Ezekiel xlvii : 16, a city near Damascus. Shamash, not Ninib or Adar, was the god of Sippar. Adar is known to have been worshipped in Phœnicia. The identification of Adar with a Melech, or Milk, demanding human sacrifices, also points to Syria rather than to Babylonia, where there is no evidence that such sacrifices were offered.

2. A son of Sennacherib who, together with his brother Shar-ezer, killed his father while he was worshipping in the temple of Nisroch, his god, and then fled to Ararat (II. Kings xix: 37). The Babylonian chronicle (*Keilinschriftliche Bibliothek*, II., 281) mentions only one son. It is possible that a letter to "Shar-itir-Ashur, king of the world," gives us the throne name of this son, abbreviated in the Hebrew as Sharezer, who held the throne from the 20th Tebet to the 2d Adar, 681, and that Adad-malik, corrupted Adar-malik, was his private name. The murder undoubtedly took place in Babylon, according to a statement of Ashur-banipal, and the temple was then the I-zagila of Marduk, the name of this god having been intentionally distorted, as in the case of Abd-nego for Abd-nebo. Consult Winckler, in Schrader's *Die Keilinschriften und das Alte Testament* (Leipzig, 1902).

ADRAR, ȧ-drär′. A region in the western part of Sahara, east of the Spanish possession of Rio de Oro, of which it formerly constituted a part (Map: Africa, C 2). Its area is estimated at about 30,000 square miles, and it contains a considerable portion of fertile land on which grain and dates are raised. Its position on the caravan route of Morocco gives it considerable commercial importance. The inhabitants are mostly Berbers. In accordance with the agreement of 1892 it forms at present a part of French Sahara. The chief town is Wadan, with a population of about 4000.

ADRASTE, ȧ′dräst′. The hero of Molière's comedy *Le Sicilien, ou l'amour peintre* (q.v.), from whose disguise as an artist comes the subtitle of the piece.

AD′RASTEI′A (Gk. Ἀδράστεια). In Grecian mythology, the Cretan nymph by whom the infant Zeus was cared for in the cave on Mount Dicte, at his mother's request. The name is also applied to Rhea herself and to Nemesis.

ADRAS′TUS (Gk. *Ἄδραστος, Adrastos*). King of Argos, who gave his daughter in marriage to Polynices, son of Œdipus (q.v.), and led the expedition of the "Seven against Thebes" to restore Polynices to the throne. As was predicted by Amphiaraüs (q.v.), Adrastus alone escaped alive. A later story makes him die of grief at the death of his son in the war of the Epigoni against Thebes. Adrastus was worshipped at Sicyon, Megara, Athens, Argos, and in the Troad. See EPIGONI; ETEOCLES AND POLYNICES.

ADRENALIN. A medicine made from the suprarenal capsules (q.v.).

ADRETS, ȧ′drā′, FRANÇOIS DE BEAUMONT, Baron des (1513-87). A French Protestant soldier, from 1562 prominent for persecuting the Catholics of Dauphiné and Provence. He was born at the Château de la Frette, Dauphiné, early entered the army, and during the wars of the League achieved a reputation for cruelty on the Huguenot side corresponding to that of the Duke of Guise or the notorious Monthic among the Catholics. His acts, however, appear to have been dictated less by religious fanaticism than by predilection for the career of brigand and bravo. Having assumed the style of lieutenant-general of the King, he organized pillage and murder on a large scale, and, as Martin (*Histoire de France*) testifies, he left among the simple peasantry a name repeated for centuries as synonymous with destruction. Many interesting tales regarding him are still preserved. Ultimately he accepted the Roman faith. For a detailed account of his doings, consult Beza, *Histoire ecclésiastique des Églises Réformées* (edited by Baum, Cunitz and R. Reuss, Paris, 1883-89, 3 volumes).

ADRIA, ä′drē-ȧ (ancient *Adria*, *Atria*, *Hadria*, or *Hatria*). An episcopal city of Italy, province of Rovigo, 16 miles southwest of Venice (Map: Italy, G 2). It was originally an island, and in the time of the Romans was a station for the fleet and a flourishing port. After the fall of the empire frequent inundations of the Po and the Adige, caused by the bad state of the dikes, brought down alluvial soil and gradually extended the land until Adria attached itself to the continent. It is now 14 miles from the Adriatic. The ruins of the ancient city that was sacked and burned by the Venetians in the fifteenth century are south of the present city and several meters below the surface. The chief trade is in wine, cattle, grain, silk, linen, leather, and pottery. Pop., 1901, 15,678.

A′DRIAN. Roman emperor. See HADRIAN.

A′DRIAN. The county seat of Lenawee Co., Mich., on the Raisin River, at the intersection of the Wabash, Lake Shore, Detroit, Toledo and Ironton railroads, 70 miles southwest of Detroit (Map: Michigan, J 7). It was settled in 1825, incorporated as a village 1828, and as a city 1853. It is the seat of Adrian College, a Methodist Protestant institution, and of the State Industrial Home for Girls. Adrian has important industrial interests, including extensive wire fence works, steel post works, and piano and organ works, and manufactures rural mail boxes, mail-box posts, etc. It is governed by a charter adopted in 1861 and revised in 1897, which provides for a mayor, elected annually, and a city council of twelve members. Adrian carries on its public works by city labor under city supervision. Pop., 1890, 8756; 1900, 9654; 1904, 10,680.

ADRIAN. The name of six popes, two of them of considerable interest. ADRIAN I., Pope 772-795, invited Charlemagne to enter Italy. His letters are in Migne, *Pat. Lat.*, xcviii.—ADRIAN II., Pope 867-872. His letters are in Migne, *Pat. Lat.*, cxxii. and cxxix.—ADRIAN III. (Agapetus), Pope 884-885. He was the first occupant of the papal chair to change his name on election.—ADRIAN IV. (Nicholas Brakspere), Pope 1154-59. He was by birth an Englishman, the only one of that nation who ever sat in the papal chair. His father became a monk in the Benedictine monastery of St. Albans, and so Adrian was in early life thrown on the world. He became first a lay brother or servant in the monastery of St. Rufus, about 50 miles south of Lyons, France, then successively regular monk, prior, and in 1137 was elected abbot. His zeal for strict discipline raised a combination to defame his character, and he had to appear before Eugenius III. at Rome. Here he not only cleared himself of all charges, but gained the esteem of the Pope, who appointed him Cardinal-bishop of Albano in 1146, and, later, delegate to Scandinavia. On the death of Anastasius IV. in 1154, he was raised to the papal see. Adrian had great trouble with the Romans, who disliked his pretensions, and were influenced by Arnold of Brescia, whom he caused to be put to death. He was on friendly terms with the Emperor Frederick I., until his high notions of the papal supremacy, which he carried as far as even Gregory VII., led to the beginning of that long contest of the popes against the house of Hohenstaufen, which ended in the destruction of the dynasty. He was living away from Rome in practical exile, and was about to excommunicate Frederick when he died at Anagni, September 1, 1159. His most remarkable pontifical act was giving, in 1154, Ireland to Henry II., which he claimed he had the right to do because all islands which had been Christianized belonged to the Holy See. Consult: S. Malone, *Adrian IV. and Ireland* (London, 1899). His letters are in Migne, *Pat. Lat.*, clxxxviii.—ADRIAN V., Pope July 12-August 18, 1276 (Otto buono de' Fieschi), and a cardinal-deacon when elected; he died before he had been consecrated a bishop.—ADRIAN VI., Pope January 9, 1522, to September 14, 1523. His family name was (probably) Dedel, his birthplace Utrecht (1459), his first teachers the Brothers of the Common Life; his professional studies were made at Louvain, and there he became professor of theology. He was appointed tutor to Charles of Hapsburg (the future Emperor Charles V.), 1507; was made Bishop of Tortosa, Spain, 1516; cardinal, 1517. Charles made him regent of Spain, 1520, but the Spaniards resented the rule of a foreigner and embittered his life. His troubles did not cease when elected Pope, but he inspired respect by his uprightness. He confessed to serious corruptions in the Church, but died before he could do anything for its reform. Consult the *Lives* by H. Bauer (Heidelberg, 1876) and by A. Lepître (Paris, 1880).

A'DRIAN DE CASTEL'LO, or **ADRIANO DI CASTELO**, ä'drê-ä'nô dê käs-tĕl'lô (c.1460-c.1521). An Italian scholar and ecclesiastic. He was born in Tuscany and went to England in the reign of Henry VII., who made him his agent at Rome and gave him the bishopric of Hereford (1502), whence he was translated to that of Bath and Wells (1505). He was made cardinal by Pope Alexander VI. (1503). In 1517, however, he was implicated in the conspiracy of Cardinals Petrucci, De Sauli, and Riario to poison Leo X. and was deprived of his cardinalate and dignities in England (1518). What became of him afterward is uncertain. It is thought that he lived in retirement at Venice and was murdered while on his way to Rome after the death of Leo X. in 1521. His writings include: *Venatio*, a poem (1505); *De Vera Philosophia* (1507), and *De Sermone Latino et Modo Latine Loquendi* (1513).

A'DRIANO'PLE (Gk. Ἀδριανόπολις, *Hadrianopolis*, the city of Hadrian, Turk. *Edirneh*) (Map: Turkey in Europe, F 4). A city of European Turkey, in ancient Thrace. It is situated on the Maritza (the ancient Hebrus), where that river is joined by the Arda and the Tunja, about 140 miles northwest of Constantinople, with which it is connected by a state railway line. Its position at the confluence of three navigable rivers, and at the meeting of several routes, makes it a place of considerable commercial importance. It was formerly fortified by a strong wall, of which only a few fragments are left. The place is now defended by an extensive circle of redoubts. Since the last Russian-Turkish war the town has been in a state of decline, and its commerce has fallen off to a large extent. It has two fine bazaars, a palace, numerous inns, churches, and schools. The population is about 81,000, about half of whom are Turks and the remainder Bulgarians, Armenians, and Jews. It is the seat of several European consuls. A very ancient town of Thrace, it was rebuilt by the Emperor Hadrian, who gave it his name. It was the scene of an important battle between the Goths and the Romans in 378 A.D., in which the former were victorious and broke through the Roman frontier, effecting a settlement within the limits of the empire. The city was conquered from the Byzantines by Amurath (Murad) I. in 1361, and was the residence of the Turkish sultans from that time down to 1453. The Russian general Diebitsch occupied Adrianople in 1829. By the treaty signed here on September 14 of that year Russia forced Turkey to relinquish to her the northeastern coast land of the Black Sea and to allow her to establish her sway over the tribes of the Caucasus; to cede to her the district of Akhaltsikh; to accord to her a protectorate over Moldavia and Wallachia; and to recognize the independence of Greece. After the capture of the Turkish army defending the Shipka Pass, in January, 1878, the Russians entered Adrianople unopposed. The occupation of the city was followed by the cessation of hostilities and the conclusion of the treaty of San Stefano. Adrianople is the capital of the vilayet of the same name, with an area of about 14,822 square miles and a population of about 1,028,200.

A'DRIAN'S WALL. See ROMAN WALL.

ADRIATIC SEA, ā'drĭ-ăt'ĭk *or* ăd'rĭ- (From the Etruscan city Hatria, modern Adria, at the mouth of the Padus or Po). A large arm of the Mediterranean Sea, separating Italy from the Balkan peninsula, and communicating with the Ionian Sea by the Strait of Otranto. It is 500 miles long, and about 130 miles in its greatest width (Map: Italy, J 4). Its depth varies from over 5000 feet near Durazzo at its southern end, to only about 500 feet in the north. Its western coast is almost unbroken, while the eastern is lined with numerous rocky islands, belonging to Istria and Dalmatia. The main gulfs of the Adriatic Sea are Manfredonia on the west, Venice and Triest on the north, and Quarnero on the northeast. The only considerable rivers emptying into it are the Adige and the Po, and that accounts for the great salinity of its water. The most important commercial points are Triest, Venice, Fiume, Ancona, and Brindisi. The navigation of the Adriatic is generally safe, although there are some dangerous points off the eastern coast. The commercial importance of the Adriatic Sea was greatly impaired by the opening of the sea route of India; but with the opening of the Suez Canal it has regained some of its former commerce. Consult: C. E. Yriarte, *Les bords de l'Adriatique* (Paris, 1878); G. L. Faber, *The Fish and Fisheries of the Adriatio* (London, 1883).

ADRIENNE LECOUVREUR, ȧ'drĭ-ĕn' le-kōō'vrẽr'. The title of a five-act French drama by Scribe and Legouvé, based on the tragic history of the noted actress. (See LECOUVREUR, ADRIENNE.) It was produced April 14, 1849.

ADRIFT'. Floating at random. The state of a boat, vessel, buoy, or other floating object which has parted or lost its lines or moorings and is driven about by the tide, sea, or wind;

also the condition of a sail, gun, or other object which has broken loose from its fastenings.

ADUA, ä′dōō-ȧ. See ADOWA.

AD′UAT′UCI or **AD′UAT′ICI.** A people of Belgic Gaul, dwelling in Julius Cæsar's time near the River Sambre, and conquered by him 57 B.C. They were descended from survivors of the Cimbri and Teutones after their defeat by C. Marius, 102–101 B.C.

ADULARIA. See ORTHOCLASE.

ADU′LE (Gk. Ἀδούλη, *Adoulē*). An ancient Ethiopian town on the Red Sea, near the modern Zula. It was an important trading post, especially for fine ivory. It is noted chiefly on account of an inscription of some importance relative to the ancient geography of those regions, the Monumentum Adulitanum, really two inscriptions, one celebrating the victories of Ptolemy Euergetes, the other the much later conquests of a native king. Both are of value for ancient geography, and were first published in the sixth century in the *Topographia Christiana* of Cosmas Indicopleustes.

ADUL′LAM. A city in the lowlands of Judæa, which was the abode of a Canaanite king before the conquest of the country by the Israelites (See Joshua xii : 15), and continued to be an inhabited town at least as late as the Maccabees. Its locality has been identified by some scholars with that of the modern Dier Dubban, some distance west of Bethlehem, and by others with that of Aid-el-ma, a few miles northeast of Hebron.

ADUL′LAM, CAVE OF. A cavern in southern Judæa, noted as a retreat of David while he was in hiding with his band of four hundred outlaws from King Saul (see I. Samuel xxii), and later when as king he was fighting the Philistines (I. Chronicles xi : 15). It was perhaps near the town of the same name, some ten miles northwest of Hebron.

ADUL′LAMITES. A term applied in English history to those seceding Liberals who voted with the Conservative party when Earl Russell and Mr. Gladstone sought to extend the elective franchise in 1866. The designation of *Adullamites* was fastened on the new party by Mr. Bright, who, in the course of debate, likened them to the political outlaws who took refuge with David in the cave of Adullam (I. Samuel xxii : 1, 2). The comparison was taken up by Lord Elcho, who humorously replied that the band congregated in the cave was hourly increasing, and would succeed in delivering the House from the tyranny of Saul (Mr. Gladstone) and his armor-bearer (Mr. Bright). The group of seceders was also known as "The Cave," and as "The Cave of Adullam."

ADUL′TERA′TION (Lat. *adulterare*, to defile, to falsify). The act of intentionally debasing articles offered for sale, by abstracting from them some valuable constituent, or by adding to them some worthless, more or less deleterious, foreign substance. Adulteration has been practiced throughout the civilized world since early in the Middle Ages, and unfortunately the methods and devices used by unscrupulous men of commerce in adulterating commodities in common use have kept pace with the progress of the useful arts. According to the laws of many of the States a food is declared to be adulterated under the following conditions: "First, if any substance or substances have been mixed with it, so as to lower or depreciate or injuriously affect its quality, strength, or purity; second, if any inferior or cheaper substance or substances have been substituted wholly or in part for it; third, if any valuable or necessary constituent or ingredient has been wholly or in part abstracted from it; fourth, if it is an imitation of or is sold under the name of another article; fifth, if it consists wholly or in part of a diseased, decomposed, putrid, infected, tainted, or rotten animal or vegetable substance or article, whether manufactured or not, or, in the case of milk, if it is the product of a diseased animal; sixth, if it is colored, coated, polished, or powdered, whereby damage or inferiority is concealed, or if by any means it is made to appear better or of greater value than it really is; seventh, if it contains any added substance or ingredient which is poisonous or injurious to health: *Provided*, That the provisions of this act shall not apply to mixtures or compounds recognized as ordinary articles or ingredients of articles of food, if each and every package sold or offered for sale bear the name and address of the manufacturer and be distinctly labelled under its own distinctive name and in a manner so as to plainly and correctly show that it is a mixture or compound, and is not in violation with definitions fourth and seventh of this section."

Among the commodities often sold in an adulterated state may be mentioned: beverages, both alcholic and non-alcholic, cocoa and chocolate, coffee, condiment sauces, butter, cheese, cream, milk, edible fats and oils, such as lard and olive oil, flavoring extracts, jellies and jams, preserved meats, spices, syrups and molasses, and vinegar. In general, liquid foods and powdered and comminuted preparations lend themselves readily to adulteration. On the other hand, substances of a distinctive structure, which cannot be mixed with foreign material without a change of outward appearance, are much less likely to be adulterated.

The sale of a spurious article under the name of the genuine article for which it is intended to pass is a common-law cheat, and modern legislation is extending the scope of this crime with a view to the protection of health and the promotion of honest and fair business dealings. Common law cannot be depended on, however, to protect the community from adulterated goods. The amount at stake is not sufficient to warrant the consumer in bringing action against the vendor who has sold him such goods, and as a matter of fact, the question is never referred to common law. Since the middle of the last century the subject of food adulteration has attracted a constantly increasing amount of attention, and specific legislation intended to correct its evils has increased. In 1883 the first practicable food-inspection law in the United States was enacted in Massachusetts. Other States have gradually followed the example of Massachusetts, and in 1906 no less than twenty-seven States had taken serious steps toward regulating the character and quality of their food products by enacting and enforcing food laws. In two additional States laws relating to the purity of dairy products are enforced, and in several others a beginning has been made. Food legislation has received much attention abroad, and the more highly civilized foreign countries have efficient food laws and enforce them rigidly. Of course such laws have the widest scope in countries with a strongly centralized form of government. In the United States several laws have been passed relating to the purity of special foods, but no Federal legislation has been enacted except that relating to imported foods.

The following are some of the more common forms of adulteration:

Wine is sometimes prepared artificially by the fermentation of glucose with the addition of raisins, or some fruit juice. Such products, however, are not sold as a beverage to any extent. The cheaper grades of wine are sometimes colored artificially, and chemically preserved. Carbonated wines, prepared by dissolving in ordinary wine carbolic acid gas under pressure, are sometimes sold as champagne.

Non-alcoholic beverages, such as ginger ale and fruit syrups, are commonly preserved with salicylic acid and benzoic acid, and colored with coal tar derivatives. These products are sometimes altogether artificial in their nature.

Canned vegetables, contrary to the general impression, are relatively free from adulteration. Being hermetically sealed, no artificial preservative is necessary, and, generally speaking, none is used. In this class of goods artificial color is employed with tomatoes, and some imported products, such as peas, are colored with salts of copper. Vegetables, such as peas and beans, which have reached a relatively mature state, are frequently soaked for some time, canned, and placed on the market as high grade materials. Such products cannot be criticised because of unwholesomeness, but should be labelled "Soaked." In the preparation of sugar corn it is customary to add a small amount of cane sugar. The use of saccharin for this purpose in place of sugar is rare.

Breakfast foods. In connection with the question of food adulteration, a word may be said as to the claims of breakfast-food manufacturers. In no case are the claims of manufacturers more absurdly exaggerated than in the case of breakfast foods, which, while generally wholesome, are positively in no way superior as foods to the ordinary cereal products.

Flour is practically free from adulteration. It is said that formerly ground mineral matter was employed as an adulterant, and that alum was used for whitening. These substances, however, if ever used at all, have not been used for a number of years. The practice of adulterating wheat flour with corn-meal was quite prevalent some years ago, but has been entirely discontinued in the United States.

Cocoa and chocolate preparations are frequently mixed with starchy cereal products and other starchy ingredients, such as wheat, rice, maize, arrowroot, and potato starch. An excess of cocoa husks is also reported in such preparations, showing that the husks have not been completely removed in the preparation of the product, or that an actual addition of husks has been made.

Coffee, when sold in the ground state, is frequently adulterated. Chicory, which was formerly used almost entirely for this purpose, has now given way largely to ground peas, wheat, beans, barley, and other materials. Attempts have repeatedly been made to adulterate unground coffee with artificially moulded pellets made to resemble the coffee bean, and composed of the constituents mentioned above. Such attempts have apparently not been successful, however, as products of this nature are no longer found in the market in this country. The principal offense in the coffee trade is misbranding in regard to country of origin. The sale of Brazilian coffee, for example, as Java or Mocha, is unfortunately very common.

Catsups are commonly colored and preserved artificially. Manufacturers prepare tomato pulp in large quantities when tomatoes are most plentiful, and store it in barrels. In order to keep it in this manner chemical preservatives are necessary, and as, further, continued storing of the pulp causes some loss of color, manufacturers often add more or less foreign coloring matter.

Butter is frequently renovated after it has become stale, and much inferior country butter is treated in the same manner. The product is first washed with alkali to remove rancidity and the fat is churned with fresh milk, the product so made being sold as fresh butter. This practice has been greatly lessened by Federal legislation. The sale of oleomargarin as butter has been practically stopped by Federal and State legislation.

Cheese is frequently adulterated by removing the cream from the milk from which it is made and replacing the cream by fat of other origin.

Cream is sometimes preserved artificially, and is frequently given a fictitious appearance by means of "thickeners." Gelatin is frequently used for this purpose. Since in the use of cream the dietetic value of fat is taken into consideration, especially in the preparation of food for infants, the sale of a product adulterated in this manner is to be strongly condemned.

Milk lends itself very readily to adulteration. Considering the fact that a large portion of the milk supply is consumed by infants and invalids, its purity is a matter of greater importance than that of any other food. Milk is commonly adulterated by dilution with water or by removal of cream. The nefarious practice of adding water is often aggravated by the fact that the water used is dangerously bad. It is thus that milk may be a source of typhoid fever and of other dangerous diseases. On the other hand, skimmed milk contains a large amount of protein, and is, as a source of such matter, very cheap. Its sale under a proper label cannot, therefore, be objected to on any ground whatever. Of course, it is unfit for infants and often for invalids. Milk is frequently treated with chemical preservatives. Boric acid was formerly used for this purpose to a considerable extent but now formaldehyde is the only preservative commonly employed. The use of preservatives enables the vendor to keep the milk at a higher temperature and to ship it over considerable distances without the use of refrigeration, and it eliminates to an extent the necessity of cleanliness in the dairy. The addition of preservatives to such an article as milk, however, is almost universally considered to be inexcusable.

Lard. Most of the States in this country have enacted specific laws governing the manufacture and sale of this product and the adulteration of lard is now unusual. Cooking fats are commonly prepared by mixtures of cotton-seed oil, beef suet, etc., but they are usually sold as "compound lards" and not represented to consist of lard alone. In order to correct the excessive softness of lard, high-melting stearin from beef fat is frequently added to it. The percentage of stearin added is higher in the summer than in the winter, and in the product consumed in hot climates than in that consumed in cold climates.

Salad oils. The substitution of cheaper oils for olive oil is very prevalent in this country. A cheap adulterant is cotton-seed oil, although some sesame and peanut oils are imported for the purpose of adulterating cotton-seed oil. Until recently the importation into the United States of olive oil adulterated with sesame and peanut oil was not uncommon. The enforcement of our imported food law has entirely stopped the importation of such products in bottles, but such oils are still brought in barrels and bottled in this country.

Flavoring extracts are commonly adulterated with cheaper products. An extract of the tonka bean is frequently substituted for vanilla extract, and a still cheaper product is prepared in the form of a solution of artificial vanillin colored with caramel. Lemon extract is sometimes substituted by an extract prepared from lemon grass. Lemon oil is sometimes distilled with steam and the non-volatile product used for the preparation of the so-called terpeneless extract. This class of products is never labelled terpeneless extract, however, but is placed on the market simply as lemon extract. The terpenes obtained by this method of distillation are again used in the preparation of a product that is sold as lemon extract, although the non-volatile portions of the lemon oil are absent.

Jellies, jams, and marmalades are often adulterated with glucose and artificially colored and preserved. In the cheapest forms of these products no fresh fruit is employed, the product consisting entirely of an extract prepared from dried apple peelings and cores and glucose, artificially colored and sometimes artificially flavored. As a result of recent legislation it is not uncommon for articles of this nature to be labelled with a declaration regarding their nature. Usually, however, these declarations are misleading.

Meat preparations frequently contain preservatives and are adulterated by the substitution, in the case of comminuted articles, as sausage and chopped meat, of a cheaper article than that supposed to be present. Fresh meat is probably never subject to adulteration except on the block of butchers who are not equipped with storage facilities. Oysters, when kept in bulk after shucking, are frequently preserved.

Spices are usually sold in the ground state and for that reason are easily imitated. They are frequently adulterated with ground cereals, cocoanut shells, almond shells, sometimes parched, and sawdust. Even the whole spices are sometimes distilled with steam to remove the essential oil and then placed on the retail market.

Sugars, both high and low grade, are practically free from adulteration.

Syrups, honey, and similar preparations are commonly adulterated with glucose. In by-products from sugar mills, tin salts used for washing the crystals in a centrifugal are sometimes found.

Flour and bread are practically free from adulteration. The adulteration of flour with ground mineral matter and with alum was probably never practised in this country. Its adulteration with corn-meal was quite prevalent at one time and seriously threatened the flour industry. This evil was entirely corrected, however, by the passage of the Federal mixed flour law in 1898.

Vinegar in the United States is understood to be a product of the acetic fermentation of apple juice without any addition whatever. The product on the market, however, is frequently adulterated, fermented sugar-house residues forming the basis of much of the vinegar on the markets. Frequently apple jelly is added for the purpose of giving the necessary body and assimilating to a certain extent the flavor of cider vinegar. In such cases caramel is frequently employed for the purpose of coloring the product.

Chemical Preservatives. During the last half century the practice of using chemicals to preserve food has sprung up. By means of such chemicals foods may be preserved with much less desiccation than is possible otherwise, and the taste of the fresh article is retained practically unchanged. The substances most commonly employed are formaldehyde with milk, boric acid with butter and with meat preparations, sulphites with beer and meat, and salicylic and benzoic acids with beverages of all kinds and fruit preparations. Fluorides are not unknown as preservatives and, while their use is not common, they are employed with many varieties of foods. Preservatives cheapen the production of prepared foods, as with their use it is possible to transport and store products in a partially prepared state until it is convenient to complete the manufacture. It is possible, in making tomato catsup, for instance, to prepare the pulp, by cooking and straining off the insoluble material, during the growing season and preserve it with salicylic or benzoic acid for working up later, so that a small plant can be kept in operation throughout the year. The question as to the wholesomeness of these preservatives has not been definitely settled. It is conceded, however, that some of them are injurious to health, that they should not be employed where it is practicable to dispense with their use, and that wherever they are employed a plain statement of that fact should be made on the label.

Coloring Matter. The objection to the use of coloring matter with foods is from the standpoint of fairness and honesty rather than from that of wholesomeness. In the adulteration of foods with articles of less value it is frequently found impracticable to select substitutes of the same color as that of the substances supposed to be employed. To remedy this defect and make the adulterated product more nearly resemble the article it simulates, coloring matter is added. Formerly coloring matter was obtained from vegetable sources. At present artificial colors are almost exclusively employed. The use of coloring matter has already been referred to above in connection with several articles of food. In addition to those mentioned, fruit jelly, prepared from glucose and apples, is frequently colored artificially and sold as currant, strawberry, or grape jelly. Cane sugar is colored and flavored and sold as maple sugar. Glucose is colored and sold as honey, or as syrup of different origin. Canned tomatoes, which would bring a relatively low price because deficient in color, are frequently treated with an aniline dye. Flour is sometimes added to spices, such as pepper, and the natural coloring matter of the spice is replaced with charred cocoanut shells. Many colors which are used with foods are admittedly unwholesome, and, furthermore, from the method of their manufacture, they may contain small amounts of poisonous metals, such as arsenic. Although, in general, the amount of coloring matter required is very small, it is believed that the use of those which are unwholesome should be prohibited. Several European countries have enacted laws forbidding the use of certain colors, and specifically permitting the use of others.

Drugs are sometimes adulterated by the addition of substances resembling the genuine articles in outward appearance but having none of their valuable physiological effects. The practice cannot be denounced too strongly or punished too severely. The fraud can usually be detected only by careful chemical examination.

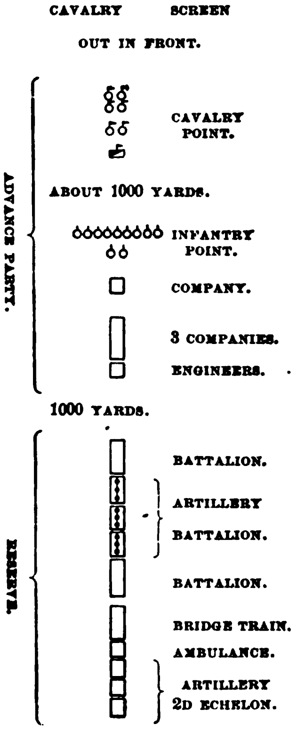
Consult: In English, Wiley, Richardson, Crampton, and Spencer, *Foods and Food Adulterants*, 7 parts (Washington, 1887-92); Wedderburn, *Report on the Extent and Character of Food and Drug Adulteration* (Washington, 1894); Bower, *Simple Methods for Detecting Food Adulterations* (London, 1895); Blythe, *Foods, Their Composition and Analysis* (London, 1903); Leach, *Food Inspection and Analysis* (New York, 1904); Leffmann and Beam, *Select Methods of Food Analysis* (ed. 2, Philadelphia, 1905); Winton, *Microscopy of Vegetable Foods* (New York, 1906); also the Bulletins and Reports of the Bureau of Chemistry, United States Department of Agriculture, and of the food commissions of various States. In German, Röttger, *Kurzes Lehrbuch der Nahrungsmittel=Chemie* (Leipzig, 1894); Bujard and Baier, *Hilfsbuch für Nahrungsmittel=Chemie* (ed. 2, Berlin, 1900). In French, Bellenger, *Manuel de l'Inspecteur des denrées alimentaires* (Paris, 1894); Chevallier and Baudrimont, *Dictionnaire des altérations et falsifications des substances alimentaires, medicamenteuses et commerciales, avec l'indication des moyens de les reconnaître* (Paris, 1893-97); Girard, *Analyse des matières alimentaires* (ed. 2, Paris, 1904). See FOOD.

ADUL'TERY (Lat. *adulterium*, the violation of another's bed, from *ad*, to + *alter*, other). "The voluntary sexual intercourse of a married person with a person other than the offender's husband or wife." By the canon law, the husband and wife were placed on the same footing; and this view has been adopted by all the nations of modern Europe. In America it has never been doubted that the offense necessary to found the sentence of divorce is committed by unlawful sexual intercourse equally whether the *particeps criminis* were married or single. In Rome, the Julian law, enacted in the time of Augustus (17 B.C.), revised the previous legislation on the subject, and imposed special penalties, consisting of forfeiture of goods and banishment, both on the adulteress and the paramour. The husband, in certain cases, was permitted to kill the latter, and the father might sometimes kill both. A constitution of Constantine, the authenticity of which has been doubted, made adultery a capital offense on the man's part. Whatever Constantine's law was, it was confirmed by Justinian, who further condemned the wife to be whipped, and imprisoned in a convent for the rest of her days, unless relieved by her husband within two years (*Novel.* 134, c. 10). The offense was visited in Athens with punishments closely resembling those of the earlier Roman legislation. In many Continental countries adultery is still treated as a criminal offense, but in none of them does the punishment now exceed imprisonment for a limited period, which is frequently accompanied with a fine. Lord Coke says that by the law of England in early times adultery was punished by fine and imprisonment. During the Commonwealth it was made a capital offense, but this law was not confirmed at the Restoration. In Scotland the records of the Court of Justiciary show that capital punishment was frequently inflicted. At the present day it is punishable in Great Britain only by ecclesiastical censure, and even this may be regarded as in desuetude. But when committed by the wife it was regarded as a civil injury, and, till the passing of the stat. 20 and 21 Vict., c. 85 and 59, formed the ground of an action of damages for criminal conversation (commonly known as an action of *crim. con.*) by the husband against the paramour. No corresponding action was competent to the wife, either in England or America, until recently, and her only remedy consisted in obtaining a separation or divorce. In some of the United States adultery is made criminal by special law; in some the act itself is not a crime, but open and continued adultery, amounting to a public nuisance, is. Some statutes define the crime, some only state the punishment; and this leaves a wide margin for interpretation by courts, giving rise to great diversity of opinions and decisions. Some hold that if only one of the parties be married, the other does not commit criminal adultery; some that a married man with a single woman does not commit criminal adultery, because the act cannot impose spurious issue on a husband or wife. See DIVORCE, and the authorities there referred to.

AD VALO'REM (Lat., according to the value). A phrase used in customs legislation to designate taxes measured by the value of the imported article; i.e., a certain percentage of the value. Such duties, inasmuch as they fall with just proportion upon the different grades of goods, cheap as well as expensive, are in theory the most satisfactory. They involve, however, a cumbrous and often inefficient machinery for the ascertainment of values, and from the standpoint of customs administration are deemed inferior to specific duties, which levy a definite tax upon a given unit of measure (pound, bushel, gallon, etc.) of the imported articles. The tariffs of the United States embrace both kinds of duties, and sometimes, especially in the case of woolen goods, combine them.

ADVANCE' GUARD. Troops on the march are in a formation in which they cannot fight, and when they come upon the enemy they must first deploy. This takes time, especially in large columns, consequently such columns require detachments to protect them against surprise, which in an advance are placed ahead of the column and are called advance guards. Good reconnaissance by the cavalry screen in front of the army is the best protection, but this cavalry may at any time be beaten by the enemy and forced off to one flank, or it may have been drawn off in pursuit of the enemy's cavalry, hence immediate protection for the heads of the columns is still a necessity. The strength of the advance guard depends on the condition of the screening cavalry, but should be the least necessary on account of the arduous duty it demands, at the same time the units should not be broken.

A company or squadron requires only a cavalry patrol in front of it as advance guard, and stronger columns would demand greater forces, depending on the circumstances. In the first place, the cavalry division belongs to the advance guard, but in this case its duty is more security and protection than reconnaissance; consequently it remains nearer than in screening, and fights, rather than avoids, the enemy's patrol. In the case of a mixed column of all arms, the advance guard must have infantry, but how much depends on circumstances. An infantry division usually requires a regiment, but a battalion is often sufficient. Artillery is also assigned to it, usually only a battery, at most a battalion. Engineers are usually attached, with a bridge train; often also a balloon section. The advance guard is divided into the main guard and the vanguard; the latter consisting, for a regiment, of a battalion; for a battalion, of a company of infantry, with the engineers and a part of the cavalry present; the artillery is in the main guard. Before the vanguard marches the infantry point, and before the latter the cavalry point, or the cavalry of the vanguard with its point, consisting of three or four men under a non-commissioned officer. The infantry point marches on the road in closed or dispersed order, and does not stop to reconnoitre small places. For observation of the surrounding country the cavalry point is designed. It looks up observation points, moves rapidly from one to the other, and keeps touch to the rear by means of separate horsemen. The infantry point keeps touch to the rear by means of single infantrymen or cyclists. If the main column halts for a considerable time the advance guard takes up temporarily the duties of outposts, but must keep up reconnaissance. Every column of march must also be protected on the flanks by patrols, and when these small bodies are not sufficient a flank guard must be organized.



FORMATION OF ADVANCE GUARD.
(According to Meckel.)

In a retreat a rear guard is formed, and since the latter cannot, as a rule (like the advance or flank guard), count on the immediate support of the main body, it must be stronger than either of the others, and requires more artillery, and also cavalry, the latter playing the part of mounted infantry in this case. All European armies, except the German, have a small rear guard besides the advance guard in an advance. France and Russia have very strong advance guards and send them far out to the front. See OUTPOSTS; RECONNAISSANCE; BATTLE; and TACTICS, MILITARY.

ADVANCE′MENT. In law, a gift by a parent to a child of all or a portion of the share of the parent's personal property to which the child would be entitled upon the death of the advancer intestate. An advancement has the effect of reducing by its amount the distributive portion that would come to the receiver upon the death of the parent. The doctrine of advancement is applicable only to gifts from parent to child, but has been extended to gifts to others by statute in some States. An advancement is not required to be made in any particular form. Any such gift is presumptively an advancement, but the contrary may be shown. The subject is now generally regulated by statute, and in many jurisdictions real estate may be given by way of advancement to the heir. (See ADEMPTION.) Consult: Thornton, *Law Relating to Gifts and Advancements* (Philadelphia, 1893).

ADVANCEMENT OF SCI′ENCE, ASSOCIATIONS FOR THE. Important bodies of scientific men in America, Great Britain, France, and other countries. The purpose of these associations is to emphasize the solidarity and unity of interests among workers in all branches of science, to give a stronger impulse to scientific research, both theoretical and practical, and to gain for scientific achievement a more immediate recognition and a wider usefulness, through the means of financial bequests, the publication of *Reports*, and the offering of special facilities for the prosecution of original and difficult scientific work. The organization of the societies was one of the numerous manifestations of the scientific spirit of the nineteenth century; and the continued growth of this spirit was shown at a joint meeting of the British and French associations in September, 1899, when plans were formulated for an international association for the advancement of science, art, and education. The first meeting of this international association was held in Paris during the exposition of 1900. The American Association for the Advancement of Science, now one of the most noted scientific societies of America, was founded in 1847 as an outgrowth of the association of American geologists and naturalists. The association is organized in ten sections, each of which holds its own convention at the annual meeting of the association during the summer. The sections embrace the following departments of science: *A*, mathematics and astronomy; *B*, physics; *C*, chemistry; *D*, mechanical science and engineering; *E*, geology and geography; *F*, zoölogy; *G*, botany; *H*, anthropology; *I*, social and economic science; *K*, physiology and experimental medicine. The association also serves as a centre for the meeting of a number of important special scientific societies which have become connected with it. The association publishes annually a volume of *Proceedings*, and in 1901 became affiliated with the journal *Science*, making it the semi-official organ of the society. The membership of the society is about 4000. The British Association for the Advancement of Science was founded in the city of York in 1831, under the leadership of David Brewster and with the coöperation of many of the most prominent men of the time. The annual meetings of the association are held for a week each summer, and consist mainly of papers read before the several sections of the society and of conferences following them. The society is divided into ten sections, each having its own president and governing committee. The society sets aside yearly a large sum for the prosecution of scientific researches which require special apparatus and the employment of assistants. The membership of the association is about 5500. Reports have been published since 1831. The French Association for the Advancement of Science (*L'Association Française pour l'Avancement des Sciences*) was formed in 1865 at Lille. The work is carried on through general meetings, publications, and the bestowal of prizes for brilliant scientific work. The four sections into which the society is divided are those of the mathematical, the physical and chemical, the natural, and the economic sciences. Records of its proceedings and of the scientific work accomplished under its guidance have been published since its organization. The Australasian Association for the Advancement of Science was formed in 1886, and the South African Association in 1903.

AD′VENT (Lat. *adventus*, the approach, coming), or **TIME OF ADVENT**. A term applied by the Christian Church to certain weeks before Christmas. In the Greek Church the time of Advent comprises forty days; but in the Roman Church and those Protestant churches in which Advent is observed, only four weeks. The origin of this festival as a church ordinance is not clear. A synod at Saragossa, Spain, in 380, enjoined that every one must attend church from December 17 to Epiphany; but not till the sixth century was Advent fully adopted as a church season. The four Sundays of Advent, as observed in the Roman Catholic Church and the Church of England, were probably introduced into the calendar by Gregory the Great. It was common from an early period to speak of the coming of Christ as fourfold: his "first coming in the flesh;" his coming at the hour of death to receive his faithful followers (according to the expressions used by St. John); his coming at the fall of Jerusalem (Matthew xxiv: 30), and at the day of judgment. According to this fourfold view of Advent, the "gospels" were chosen for the four Sundays, as was settled in the western church by the Homilarium of Charlemagne. The season of Advent is intended to accord in spirit with the object celebrated. As mankind were once called upon to prepare themselves for the personal coming of Christ, so, according to the idea that the ecclesiastical year should represent the life of the founder of the Church, Christians are exhorted, during this season, to look for a spiritual advent of Christ. The time of the year when the shortening days are hastening toward the solstice—which almost coincides with the festival of the Nativity—is thought to harmonize with the strain of sentiment proper during Advent. In opposition, possibly, to heathen festivals, observed by ancient Romans and Germans, which took place at the same season, the Catholic Church ordained that the four weeks of Advent should be kept as a time of penitence; according to the words of Christ: "Repent, for the kingdom of heaven is at hand." During these weeks, therefore, public amusements, marriage festivities, and dancing were prohibited, fasts were appointed, and sombre garments were used in religious ceremonies. The Protestant Church in Germany has also abstained from public recreations and celebrations of marriage during Advent. In the Greek Church the season dates from a period much later than in the Latin, perhaps not till the tenth century.

AD′VENTISTS. A family of religious denominations which, accepting the inspiration of the Scriptures, taking the Bible as their rule of faith, and holding to the fundamental doctrines of the Christian churches generally, expect the near approach of the end of the world and the personal second coming of Christ. They arose from the preaching of William Miller, who taught, from 1831 on, as the results of his studies of the prophetic books of the Bible, that the end of the world would come in 1843, and be followed by the coming of Christ and the installation of the millennium. When 1843 had passed the date was changed to October, 1844. Mr. Miller was joined by other preachers, and several thousand followers were gathered from many churches. The Adventists now, as a rule, simply await the second advent without attempting to fix a date for it. A declaration adopted at Albany, N. Y., in 1845, set forth a belief in the visible personal coming of Christ at an early but indefinite time; the resurrection of the dead, both the just and the unjust, and the beginning of the millennium after the resurrection of the saints; but denying that there is any promise of the world's conversion, and that the saints enter upon their inheritance at death. The Adventists baptize by immersion; and, except the Seventh Day branch and the Church of God, are congregational in polity.

1. The Evangelical Adventists. The American Millennial Association was formed in 1845 for the publication and circulation of denominational literature. The Evangelical Adventists began to call themselves by that name in 1845. They believe that all the dead will be raised, the saints first, to the enjoyment of the millennial reign with Christ and eternal bliss after the judgment, and the wicked last, to be sent into everlasting punishment, and that the dead in Hades are conscious. They have about 34 ministers, 30 churches, and 1147 members. Literature: H. F. Hill, *The Saints' Inheritance* (Boston, 1852); D. T. Taylor, *The Reign of Christ* (Boston, 1889); J. Litch, *Discussion on the Millennium* (Boston, between 1860 and 1865).

2. Advent Christians. The general association of this body was formed in 1861. The Advent Christians believe that man was created for immortality, but forfeited it through sin, and can become partner of the divine nature and

live forever only through faith in Jesus Christ; that death is a condition of unconsciousness to all till the resurrection at Christ's second coming, when the righteous will receive everlasting life and the wicked will be punished with complete extinction of being; and that salvation is free to all who will accept the conditions. They have, in the United States, 912 ministers, 610 churches, with 26,500 members, and a Bible institute. The principal publication society is in Boston. The missionary society, with an annual income of about $14,500, sustains missions in England, the Cape Verde Islands, India, and China. In home missions, it is aided by the Eastern, Western, and Southern Boards, and by the woman's society called "The Helper's Union." It also has charge of a church extension fund. The leading periodicals are: *The World's Crisis*, and Sunday school publications (all Boston); and the *All Nations' Monthly* (missionary) (Rockland, Me.). Literature: J. G. Wellcome, *History of the Second Advent Message* (Yarmouth, Me., 1874); Charles L. Ives, *The Bible Doctrine of the Soul* (Philadelphia, 1877); E. A. Stockman, *Our Hope* (Boston, 1884); Mrs. L. C. McKinstrey, *The World's Great Empires* (Haverhill, Mass., 1887); Rev. H. Constable, *Hades or the Intermediate State of Man* (Boston, 1885).

3. Seventh Day Adventists. The doctrine of the obligation of the seventh day as the Sabbath was adopted by a body of Adventists at Washington, N. H., in 1845. The central publishing house, which was established at Battle Creek, Mich., in 1860, has been removed to Washington, D. C. The Seventh Day Adventists believe that Christ's closing work as priest — the cleansing of the sanctuary and the investigative judgment — are events marked in the prophecies as beginning in 1844. They hold that the dead sleep until Christ's second coming; that in the glory of His presence the righteous will be made immortal, and the wicked destroyed. They believe that Christ's coming is near, but set no time for that event, maintaining that it is hidden from all mortals. They apply the two-horned beast (Rev., xiii) to the United States; believe in the restoration in the church of all the gifts of the Spirit, bestowed by Christ; maintain that the whole Bible is inspired; and look to Christ alone for salvation and righteousness. The writings of Mrs. Ellen G. White are held to be special illuminations of the Spirit. In 1905 the denomination had 645 ministers, 2274 churches, and 82,536 members. The chief governing body is the general conference, which is divided into thirteen district conferences. The foreign mission field includes nearly all heathen countries. The church has 11 publishing houses, over 50 sanitariums, and 19 colleges. The leading weekly periodicals are: *Advent Review and Sabbath Herald* (Washington, D. C.); *Youth's Instructor* (Washington, D. C.); *Signs of the Times* (Mountain View, Cal.); *Our Little Friend* (Mountain View, Cal.); *Southern Watchman* (Nashville, Tenn.); *The Present Truth* (London, Eng.). The monthlies include: *Life and Health* (Washington, D. C.); *The Good Health* (Battle Creek, Mich.); *Advocate of Christian Education* (Berrien Springs, Mich.); and 75 others in English and 11 in foreign tongues. Consult J. N. Andrews, *History of the Sabbath and First Day* (Washington, D. C., 1873); Mrs. E. G. White, *The Great Controversy* (Battle Creek, Mich., 1870); Uriah Smith, *Thoughts on Daniel and the Revelation* (1897).

4. The Church of God. This was formed after a division among the Seventh Day Adventists, 1864-65, concerning the acceptance of the revelations of Mrs. E. G. White as inspired and the application of Revelation xii : 11-17 to the United States. It holds to the mortality of man and unconsciousness in death; resurrection of the righteous to everlasting life and of the wicked to judgment and final extinction; observes the seventh day and practices tithing. The general conference is the head of its work and the State conferences are subordinate to it. It has 40 ministers, 5 churches, and 2500 members, with a publishing house at Stanberry, Mo., and a sanitarium at White Cloud, Mich. Periodicals: *The Bible Advocate, The Sabbath School Missionary* (Stanberry, Mo.). Literature: A. P. Dugger, *Bible Sabbath Defended* (Marion, Ia., 1881); Jacob Brinkerhoff, *Kingdom of Heaven Upon Earth* (1882); W. C. Long, *The End of the Ungodly* (1886).

5. Life and Advent Union. Organized 1860. The distinctive feature of its belief is that those who die in sin have no resurrection, but are doomed to sleep eternally, while the righteous rise to immortality. A general conference meets every year, and quarterly conferences have been instituted in some places. Four camp-meetings are held every year—in New England and Virginia. The missionary work is carried on, in the home field only, by two societies, one of which is organized among the young people. The Union has in the United States 60 ministers, 28 churches, and 3800 members. Periodicals: *The Herald of Life*, weekly (Springfield, Mass.). Literature: O. S. Halstead, *The Theology of the Bible* (Newark, N. J., 1860); *Discussion Between Miles Grant and J. T. Curry* (Boston, 1863); Pile, W. N., *The Doctrine of Conditional Immortality* (Springfield, Mass.); *The Coming Kingdom of God* (Springfield, Mass.); Brown, Wm. E., *The Divine Key of Redemption* (Springfield, Mass.); "A Disciple," *Redemption* (Springfield, Mass.).

6. The Churches of God (Age-to-Come Adventists) believe in the final restitution of all things; the establishment of the kingdom of God on the earth, with Christ as king of kings and the immortal saints joint heirs with him; the restoration of Israel; the final destruction of the wicked, and eternal life only through Christ. The journal, the *Restitution*, was begun in 1851, and a general conference representing thirteen States was formed in 1888. The Churches have 54 ministers, 95 churches, and 2872 members in the United States, and churches in Canada. Periodicals: *The Restitution* (Plymouth, Ind.); *The Rock*, and *Words of Cheer* (both Brooklyn, N. Y.). Literature: J. P. Weethee, *The Coming Age* (Chicago, 1884).

ADVEN'TIVE (Lat. *ad*, to + *venire*, to come). A plant which is but incompletely naturalized (see Naturalization) is said to be adventive. Most adventive plants are spontaneous for a few years and then disappear, while a few species become more and more numerous and ultimately become naturalized.

ADVEN'TURES OF AN AT'OM, THE. A satire by Tobias Smollett, published in 1769, and treating, under a Japanese disguise, of English politics during the preceding fourteen years.

AD'VERB (Lat. *adverbium*, from *ad*, to + *verbum*, word, verb, "the word" of a sentence *par excellence.* A literal translation by the Roman grammarians of the Gk. *ἐπίῤῥημα*, *epirrhēma*, from *ἐπί*, *epi*, at + *ῥῆμα*, *rhēma*, word, verb). As an adjective is joined to a noun, so is an adverb joined, for analogous purposes, to a verb, an adjective, or another adverb. From the frequency with which adverbs are joined to verbs, only the adverbs of degree modifying other parts of speech, they get their name. An adverb cannot be the subject, the copula, or the predicate of a proposition; and is, therefore, a secondary part of speech, logically speaking. According to their signification, adverbs may be divided into (1) adverbs of place and direction, as *where, towards;* (2) of time, as *ever, immediately;* (3) of degree, as *very, almost;* (4) of manner, as *thus, wisely;* (5) of belief or doubt, as *perhaps, no,* etc. It is commonly said that "some adverbs admit of comparison;" as if in this respect they differed from adjectives. The truth is that adverbs admit of comparison under the same limitations, neither more nor less, that restrict the comparison of adjectives. Thus, *soon* is compared as naturally as *hard.* If *now* or *thus* cannot be compared, neither can *woolen* nor *circular;* and in both cases for the same reason—the sense forbids it. The laws of euphony prevent alike *miserable* and *miserably* from being compared grammatically, i.e., by the addition of *er* and *est;* but both admit of logical comparison by the use of *more* and *most.* A large class of adverbs in English are formed from adjectives by annexing the syllable *ly,* which is derived from the word *like.* Most languages have some such means of distinguishing the adverb from the adjective, but in German they are alike. Adverbs in general may be looked upon as abbreviations of phrases; thus, *here = in this place, then = at that time, wisely = like a wise man.* Combinations of words that can thus be represented by a single adverb, and all combinations that are analogous, though they may have no single word equivalent to them, are called adverbial expressions.

AD'VERSE POSSES'SION. The possession of lands under a claim of title inconsistent with that of the true owner. It originates in the disseisin (q.v.) or ouster of the freehold tenant, and, if continued for the statutory period of limitation, results in the acquisition of a complete title by the adverse possessor or disseisor. In order to constitute a good adverse possession there must be an actual occupancy (*pedis possessio*) of the premises claimed, and an exclusion of the rightful owner from the whole thereof. The possession must be open and notorious, and continued without interruption for the requisite period. It need not be continued by one and the same person, however; a subsequent occupant who claims by descent, devise, or grant from a former occupant being entitled to tack his possession to that of his predecessor in order to make up the requisite period of adverse holding. In some of the United States it is not even necessary that the subsequent occupant shall show a legal transfer of the property to him so as to connect his possession with that of the original disseisor in order to tack the two periods. The claim of title required of the adverse possessor is not an assertion of a legal right, but only an obvious intention to hold as owner. This may be innocent, as under a will or deed which proves to be void, or unintentional, as by the accidental inclusion of another's land with that of the occupant, or it may be with the deliberate intention of gaining for one's self land belonging to another. The existence of the requisite intention, or claim of title, is a question of fact to be determined from the circumstances of the occupancy. In some of the United States certain acts (as fencing, improvement of the premises, or actual residence) have been prescribed by statute as requisite to prove the intention. In general the claim of the adverse possessor is limited to the land actually occupied; but where the claim is under color of title (i.e., under a deed, will, or other instrument describing a definite parcel of land) the actual occupation of a part may be extended by construction to the whole parcel so described. This doctrine of "constructive adverse possession" is a modern addition to the law of disseisin, and is peculiar to the United States. The period of time required to ripen an adverse possession into a valid and indefeasible title varies greatly, but it is usually fixed by statute at twenty years. (See LIMITATION OF ACTIONS.) The subject is fully considered in all the leading treatises on real property. Stephen M. Leake and Joshua Williams are the modern English authorities; Emory Washburn is the leading American writer, but his treatise should be read with caution.

ADVER'SITY HUME. A nickname given to the parliamentarian Joseph Hume (q.v.), who was noted for his attention to financial abuses in the government, and whose predictions of a crisis were justified in 1825.

ADVER'TISEMENT. In legal phraseology, a process resorted to whenever actual notice is necessary but is legally or physically impossible (as by reason of a want of jurisdiction of the parties to be notified, or ignorance of their whereabouts). Publication must be made in a newspaper published at or as near as possible to the place where the persons to be affected when last heard of resided. Such advertisement in law is construed to have the same effect as actual service of the notice, as, for example, in proceedings brought to foreclose a mortgage or other lien on real property. An attempt to notify personally all parties affected would often only result in delay, if not miscarriage, of justice. For advertisement in business, see ADVERTISING.

ADVERTISEMENTS OF ELIZ'ABETH. A series of enactments issued by Parker (q.v.), Archbishop of Canterbury, in 1566, for the purpose of establishing "due order in the public administration of Common Prayer and using of Holy Sacraments." Enforcing as it did the wearing by the clergy of the surplice and college cap, and of the cope in cathedrals and collegiate churches, it was in harmony with Elizabeth's love for decency and order in public worship; but after waiting more than a year for her official sanction, and long correspondence with Cecil, Parker was obliged to issue it on his own responsibility. During the latter half of the nineteenth century there was much controversy as to the exact force of the advertisements, which came to a head in the Ridsdale ritual case of 1877. Lord Selborne held that they were an absolute and authoritative prescription of the vestments to be worn, contending that they were the "other order" mentioned in the Act of Uniformity as to be taken later; while the

High Church party, ably represented by James Parker, considered them as merely archiepiscopal injunctions intended to enforce a minimum of ritual. Consult: Strype, *Life and Acts of Matthew Parker* (Oxford, 1821).

AD′VERTIS′ING (Lat. *advertere*, to turn [the mind] to, to notice). The method by which the producer of commodities disseminates information regarding them. For the producer it has the value of an automatic process, since it makes it possible to reach thousands of people through printed words, where formerly the seller was limited to his vocal organs. For the consumer it has the value of a system of education, since it keeps him in touch with the invention of new commodities, the improvement of old, and the constant advance in industry.

In tracing back the history of advertising, signs and criers are found in Palestine, Greece, and Rome, where they were used for public announcements and a few private purposes. Pompeii has furnished us with many wall inscriptions in red and black, as well as the familiar Roman signs, the amphora and two slaves for a wine shop, a goat for a dairy, or a boy being whipped for a school. Quaint signs prevailed throughout the Middle Ages, and the public crier was an important institution in towns. It was, however, the advent of printing and later of the newspaper which provided an adequate medium for advertising, although it was not until the industrial changes of the nineteenth century had revolutionized production, creating innumerable new commodities and stimulating new wants, that advertising could become an important feature of commercial life. In the seventeenth century small advertisements appear in the newspapers for books, tea, coffee, or medicine. The chief advertisements for a hundred years or more are curiously illustrative of the crude social customs. A heavy stamp tax hampered the growth of newspapers and advertising in England until 1855.

America is *par excellence* the country of the advertiser. In the colonial papers, advertisements furnish material for history. Brief notices tell of new goods just imported from England, coffee, slave sales, runaway slaves and servants, or lost cattle. Advertising has grown with the newspapers. In 1795 there were 200 newspapers in the United States; in 1850, 2526; and in 1895, 20,217. Newspaper advertising on a large scale dates from the establishment of the New York *Sun* in 1833, followed shortly by the New York *Herald*, the Philadelphia *Public Ledger*, and the New York *Tribune*. Estimates of the amount anually spent on advertising in the United States are as high as $500,000,000. The mediums for advertising are as follows: (1) The newspapers, magazines, and trade journals, which carry about 75% of the business; (2) occasional literature, such as catalogues, booklets, circulars, almanacs, calendars, or handbills; (3) street advertising, including billboards (see Poster), stereopticons, signs, and street-cars; (4) salesmen; and (5) personal advertising. The past twenty years have so increased the importance of advertising that specialization has become imperative. Agencies with large capital provide the mediums and suggest the methods, talented writers are in demand, effective illustration is being developed, and advertising magazines discuss the theory and practice of advertising. Business men now begin to appreciate that advertising is no mere incident of competition, but frequently the most important department, upon whose skillful management the growth and success of the business depends.

Efforts to Prevent Abuses in Advertising. The choice of farmers' barns and fences, and more especially of rocks and prominent scenic effects for the placing of advertisements, has led to various efforts to stop such abuses. A number of London societies interested in preserving historical sites or beautiful places incidentally make efforts in this direction. The Society for Checking Abuses in Public Advertising — now generally known as "Scapa" (q.v.) — is the leader in this work. It publishes circulars and asks for parliamentary action. Dr. G. Alder Blumer, Superintendent of the State Asylum at Utica, N. Y., started a crusade in 1898 to preserve the rural scenery in that vicinity. He obtained farmers' addresses from the Good Roads League and sent them Scapa circulars. The New York Central Railroad has made an effort to get rid of unsightly advertising along its line. The nuisance of circulars has been met in some cities, as in Philadelphia, by ordinances forbidding their distribution.

Bibliography. Quarterly publications of American Statistical Association, VII., New Series, No. 52 (Boston, 1900); files of advertising journals (list given in above, page 30); files of commercial journals (occasional articles); *Journal of Political Economy*, IX., 218 (Chicago); Chauncey M. Depew, *One Hundred Years of American Commerce* (New York, 1891); also Calkins and Holden, *Modern Advertising* (1905).

ADVICE′. See Bill of Exchange.

AD′VOCATE (Lat. *advocatus*, one called to aid, from *ad*, to + *vocare*, to call). In the time of Cicero the term *advocatus* was not applied to the patron or orator who pleaded in public, but rather, in strict accordance with the etymology of the word, to any one who in any piece of business was called in to assist another. Ulpian defined an advocate to be any person who aids another in the conduct of a suit or action (Digest 50, title 13), and in other parts of the Digest it is used as equivalent to an orator (see also Tacit., *Annal.*, x. 6), so that the word would seem gradually to have assumed its modern meaning. The office of the advocate or barrister who conducted the cause in public was, in Rome, altogether distinct from that of the *procurator*, or attorney, or agent who represented the person of the client in the litigation, and furnished the advocate with information regarding the facts of the case. The distinction between these two occupations is still observed in Great Britain, but in many of the states of Germany, in Geneva, in the United States, and in some of the British colonies, as, for example, in Canada, they are united in the same person. In England and Ireland advocates are called barristers, under which title will be found a statement of the duties and responsibilities which the advocate undertakes to his client, and of the state of the profession in these countries. In Scotland, as in France, the more ancient name has been retained. In France the *avocat* and *avoué* correspond very nearly to the barrister and attorney in England. The French advocate is simply a free man who has graduated in law and possesses the privilege of addressing the tribunals. The advocates who practice in each court form a separate college, admission to which can be obtained only with the approval of those who are already members. The French advocate possesses the same privileges as to irresponsibility for his advice, and for the facts contained in his instructions, which belong to members of the corresponding branch of the legal profession in Great Britain. As he has no action for his fees, they are required to be paid in advance. His functions correspond to those of the counsel, as distinguished from the attorney-at-law, in the United States. In Belgium, in Geneva, and also in those of the German States in which the Code Napoléon has been adopted, the organization and discipline of this branch of the legal profession are similar to those which prevail in France. In the other German States, with the exception of Saxony, the formation of the advocates into a body has been perseveringly resisted by the governments. See Attorney.

ADVOCATE, Lord. The public prosecutor of crimes in Scotland, senior counsel for the crown in civil causes, and a political functionary of great importance in the administration of Scottish affairs. He may issue warrants of arrest and imprisonment in any part of Scotland, is entitled to plead within the bar, and possesses many other discretionary and indefinite powers. He is a member of Parliament, and, as first law-officer of the crown for Scotland, is expected to answer all questions relating to the business of Scotland, and to take the superintendence of legislation for that portion of the United Kingdom. The corresponding office in the English system, that of the king's or queen's advocate, once of equal dignity and importance, has lately become obsolete, and its functions devolve upon the attorney-general and the solicitor-general (q.v.). In some of the English colonies and in the Indian presidencies, however, the title advocate is retained to describe the chief law officer of the crown. Consult Bell, *Dictionary and Digest of Law of Scotland* (Edinburgh, 1890).

AD'VOCATES, Faculty of. An incorporated society in Scotland, composed of about four hundred lawyers who practice in the highest courts. Applicants for admission are required to pass an examination following a prescribed course of study. From the membership vacancies on the bench are supplied.

AD'VOCA'TUS DIAB'OLI (Lat. the devil's advocate). In the Roman Catholic Church, when it is proposed that a sanctified person shall be canonized, an examination of his past life takes place. In this process one party holds the office of accuser, or *advocatus diaboli*, and it is his duty to bring forward all possible objections against the proposed canonization: while, on the other side, the *advocatus Dei* (God's advocate) undertakes the defense. Hence the term advocatus diaboli has been applied to designate any person who brings forward malicious accusations. See Canonization.

ADVOW'SON (A. Fr. *advoëson*, O. F. *avoeson*, patronage, from Lat. *advocatio*, legal assistance). In English law, the right, as patron, to present or appoint a curate to a church or ecclesiastical benefice. Advowsons are either appendant or in gross. Lords of manors were originally the only founders and the only patrons of churches, and the advowsons, when created, were usually made an incident or appurtenance to the manorial estate, which would pass with it upon alienation. So long as the advowson continues annexed or appended to the manor, it is called an advowson appendant. Such rights are conveyed with the manor as incident thereto by a grant of the manor only, without adding any other words. But where the advowson is created independently of the manor, or has been once separated from the property of the manor by legal conveyance, it is called an advowson in gross or at large. It is thus no longer incident to the property of the manor, and may be conveyed and disposed of independently of it. Advowsons are classed by Blackstone as the first of the incorporeal hereditaments, and they still constitute in England an important class of property interests. They do not exist in the United States. Consult: Stephen, *New Commentaries on the Laws of England* (thirteenth edition, London, 1899), and Phillimore, *Ecclesiastical Law of the Church of England* (second edition, London, 1895).

ADYE, ā'dĭ, Sir John Miller (1819-1900). An English soldier. He was educated at the Royal Military Academy, Woolwich, entered the royal artillery in 1836, and was assistant adjutant-general of the royal artillery in the Crimean War. He also served during the Indian mutiny in several important actions, and in various other Indian campaigns. He was director-general of artillery from 1870 to 1875, and from 1875 to 1880 governor of the Royal Military Academy at Woolwich. He was promoted in 1879 to be lieutenant-general, and was governor of Gibraltar from 1883 to 1886, when he retired from active service. He published *The Defense of Cawnpore* (1858); *Sitana: a Mountain Campaign, Recollections of a Military Life* (London, 1895), and *Indian Frontier Policy* (1897).

AD'YTUM (Lat. from Gk. *ἄδυτον*, *adyton*, the innermost sanctuary, from *ἀ*, *a*, priv. + *δύειν*, *dyein*, to enter). The most sacred part of a building, usually associated with secrecy and darkness, because in Greek and Egyptian temples, with which the term originated, it designated a furthermost recess not accessible to the people. See Temple.

ADZE. See Axe.

ÆACIDES, ē-ăs'ĭ-dēz (Gk. *Αἰακίδης*, *Aiakidēs*). A patronymic of Achilles, as the descendant of Æacus, his grandfather.

Æ'ACUS (Gk. *Αἰακος*, *Aiakos*). The fabled son of Zeus and Ægina, and king of Ægina; the father of Telamon and Peleus. He was so renowned for justice that not only men but the gods sought for his decisions. After death, Pluto made him one of the judges in Hades.

AEBY, ĕ'bĕ, Christoph Theodor (1835-85). A Swiss anatomist and anthropologist, born near Pfalzburg, Lorraine. He studied medicine at Basel and Göttingen. In 1863 he was made professor of anatomy at Bern, and in 1884 at the University of Prague. He is best known for his contributions to anthropology, which include a new and valuable craniometric method. He also demonstrated the influence of atmospheric pressure on the several joints of the human body. His published works include: *Untersuchungen über die Fortpflanzungsgeschwindigkeit der Reizung in der quergestreiften Muskelfaser* (Brunswick, 1862); *Eine neue Methode zur Bestimmung der Schädelform von Menschen und*

Säugetieren (Brunswick, 1862); *Die Schädelformen des Menschen und der Affen* (Leipzig, 1867); *Ueber das Verhältnis der Mikrokephalie zum Atavismus* (Stuttgart, 1878).

ÆCID'IOMYCE'TES (*æcidium*, see below + Gk. nom. pl. *μύκητες*, *mykētes*, mushrooms, fungi). A name formerly applied to certain forms of the "rusts." At present the name is but little used. See Uredinales.

ÆCID'IUM (dimin. of Gk. *αἰκία*, *aikia*, injury), or Cluster Cup. One form of fruit of the parasitic fungi called "rusts." See Uredinales.

ÆDIC'ULA (Lat., a small building, dimin. of *ædes*, building). In Roman literature, a designation for a small house or for part of a house. It is used especially for chapels, shrines, or free-standing niches containing statues, and for sepulchral monuments in the form of little temples or chambers. In the large temples this name was given to architectural apses or niches surmounting statues, and even to little portable models given as votive offerings. During the Middle Ages the founders of churches were often represented in sculptures or paintings holding the model of the church; such models were termed ædiculæ.

Æ'DILES. In ancient Rome, a sort of commissioners of public works, with general supervision over the public buildings (*ædes*), the cleansing and repair of the streets, the public games and spectacles, the inspection of weights and measures, and the market regulations. At first there were only two ædiles, both plebeians, and their name was derived from their headquarters, the Ædes Cereris. Afterward, two others, styled Ædiles Curules, were chosen from the patricians (366 B.C.), and Julius Cæsar appointed a new order of Ædiles Cereales to take charge of the public granaries.

ÆD'UI or **HÆD'UI.** A people of Gaul, between the Saône and the Loire, the first Gallic tribe that formed an alliance with the Romans, who therefore called them "Brothers of the Roman People" (Cæsar, *B. G.*, i. 33). Their chief town was Bibracte (Mont-Beuvray), which they later abandoned for Augustodunum (Autun).

ÆGA'DIAN ISLANDS (ancient Ægā'tes). A group of three small islands situated directly off the western coast of Sicily and forming a part of the Italian province of Trapani (Map: Italy, G 10). They consist of the islands of Favignana, the largest and best populated of the group, Marittimo, and Levanzo. The total area is about 16 square miles. The island of Favignana is very fertile and has good tunny fisheries. The population of the group is about 6000, of whom nearly 5000 are found on the island of Favignana. In 241 B.C. the Romans, under Lutatius Catulus, achieved a great naval victory over the Carthaginians off these islands, which brought the first Punic War to a close.

ÆGÆ'ON, ē-jē'ŏn (Gk. *Αἰγαίων*, *Aigaiōn*). In Greek mythology, the name by which, according to the *Iliad*, i. 403, Briareus (q.v.) was known among men.

ÆGA'GRUS, or Ægagre. The paseng. See Goat.

ÆGE'AN SEA. See Archipelago.

ÆGE'ON. In Shakespeare's *Comedy of Errors* (q.v.), the merchant of Syracuse.

Æ'GERI'IDÆ. A family of moths. See Clearwing.

Æ'GEUS (Gk. *Αἰγεύς*, *Aigeus*). King of Athens, son of Pandion. He was the father of Theseus (q.v.), and by the latter was restored to the throne of Athens, of which he had been deprived by his brother Pallas. When Theseus set out for Crete to deliver his country from the tribute it had to pay Minos, he agreed in case of success to exchange the black sail of his ship for a white one. On approaching the coast of Attica he forgot his promise, and Ægeus, believing his son lost, threw himself into the sea, which, according to tradition, was named "Ægean" after him. Ægeus is supposed to have introduced the worship of Aphrodite into Athens, where he himself was honored with a *heroön*, or shrine.

ÆGIDI, ē-gē'dē, Ludwig Karl (1825-1901). A German jurist, politician, and author, born at Tilsit and educated at the universities of Königsberg, Berlin, and Heidelberg. He was editor of the *Konstitutionelle Zeitung* until January, 1851, and extraordinary professor at Erlangen from 1857 to 1859. During the Italian war he published, while in the service of the Russian ministry, the famous anti-Austrian pamphlet entitled, *Preussen und der Friede von Villafranca* (Berlin, 1859), which was followed by *Suum Cuique: Denkschrift über Preussen* (Leipzig, 1859), and *Der deutsche Kern der italienischen Frage*. Afterward he was a professor at the universities of Hamburg, Bonn, and Berlin, and served as a member of the Prussian Chamber of Deputies (1867-68, 1873-93), and as councilor of legation in the foreign office. He published numerous writings, among which the following is perhaps the most important: *Das Staatsarchiv, Sammlung der offiziellen Aktenstücke zur Geschichte der Gegenwart* (in collaboration with Klauhold, Hamburg, 1861-71; afterward continued by Hans Delbrück, and since 1894 by G. Roloff).

ÆGID'IUS. See Giles, Saint.

ÆGI'NA (Gk. *Αἴγινα*, *Aigina*). Now Egina. An island forming part of the kingdom of Greece, about 33 square miles in extent, in the ancient Saronicus Sinus, now the Gulf of Ægina. It is mountainous, with deep valleys and chasms, and the coast affords only one haven, on the northwest. The modern town of Egina stands on the site of the ancient town, at the northwest end of the island. The island contains about 8200 inhabitants, who are chiefly occupied in trade, navigation, and agriculture. The soil produces the best almonds in Greece, with wine, oil, corn, and various fruits. An ancient legend derived the name of the island from the nymph Ægina, who was brought to it by Zeus, by whom she became the mother of Æacus, famed for his piety. The ancient Achæan population was driven out by Dorians from Epidaurus, who built up one of the richest trading cities in Greece. The Æginetans took a prominent part in the defeat of the Persians at Salamis, but with the growth of the Athenian power they were first forced to become tributary, and in 431 B.C. expelled from the island. They were later restored by Lysander, but the island never recovered its old position.

ÆGINA, or **AIGINA**, Gulf of (the ancient Saronic Gulf). An arm of the Ægean Sea, between the Peloponnesus and Attica, and separated from the Gulf of Corinth by the Isthmus of Corinth (Map: Greece, D 6). In the Gulf of Ægina are the islands of Salamis and Ægina.

ÆG'INE'TA, Paulus (Gk. Παῦλος) (seventh century A.D.). A Greek physician, born in the island of Ægina, from which he took his name. Of the details of his life little is known, save that he was a great traveler; his medical works were highly prized, though they were little more than compilations from earlier writers. The chief of these is still extant, *De Re Medica Libri Septem,* last edited by Briau (Paris, 1855). This work was translated into Arabic; there is an English version by Adams (London, 1834). See Krumbacher, *Byzantinische Litteraturgeschichte,* pages 614, 616 (Munich, 1897).

ÆG'INE'TAN SCULP'TURES. The small island of Ægina holds an important position in the history of early Grecian art, as the seat of a famous school of bronze workers, whose most celebrated artist was Onatas (about 490-460 B.C.). The school was especially noted for its statues of athletes, and seems to be connected with the Peloponnesian art. On an eminence in the northeastern part of the island stand the ruins of a temple, where in 1811 excavations conducted by Cockerell, Haller, Foster, and Linckh brought to light fragments of sculpture, which were bought by the Crown Prince, Louis of Bavaria, and after restoration (not always correct) by Thorwaldsen, set up in the Glyptothek at Munich. The statues are somewhat under life size, and once decorated the pediments of the temple. Each group represented a battle over a fallen warrior in the presence of Athena, and it is probable that one represented the Trojan expedition of Hercules, the other that of Agamemnon, as in both of them Æginetan heroes, Telamon and Ajax, were prominent. These are among the best works of archaic Greek art, of which they were for a long time almost the only examples. The artist was evidently used to working in bronze, and his technique is more appropriate to metal than stone. The anatomy of the figures is carefully modeled, but the treatment is somewhat dry and hard, in spite of an evident effort to give a realistic character to the groups. The sculptures of the eastern pediment show a decided superiority in this respect, and in particular have nearly lost the "archaic smile" which appears in the companion group. In 1901, Professor A. Furtwängler began new excavations on this site in behalf of the Prince Regent of Bavaria. These excavations have yielded a number of important fragments of the pediment sculptures, as well as of other statues and some inscriptions, of which one indicates that the temple was not dedicated to Athena, as had been believed, but to an Æginetan goddess, Aphæa, of whom little is otherwise known, but who is shown by the discoveries to have been worshiped by women as a special helper in need and as a guardian of little children. Other buildings besides the temple have been found, including traces of an earlier sanctuary. It is clear that the place was a seat of worship from the Mycenæan age, but was abandoned in the Hellenistic and Roman times. Consult for an account of the new excavations: Cockerell, *The Temples of Ægina and Bassæ* (London, 1860); Furtwängler, *Kurze Beschreibung der Glyptothek* (Munich, 1900), and *Sitzungsberichte der Bayerischen Akademie* (1901).

ÆGIR, ā'jĭr. A Norse deity who presides over stormy oceans and entertains the gods with foaming ale. His wife is Ran, who has charge of those lost at sea. They have nine daughters, the waves of the sea, whose names suggest the different appearances of the ocean.

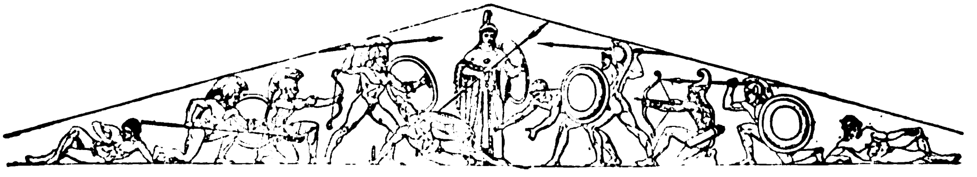
Æ'GIS (Gk. *αἰγίς, aigis,* a rushing storm, from *ἀίσσειν, aïssein,* to move violently, or *αἰγις, aigis,* a goat-skin). In the Greek epic, the shield of Zeus, which had been fashioned by Hephæstus. Later writers explained it as the skin of the goat Amalthea, which had suckled Zeus, and with the Gorgon's head in the centre. (See Gorgo.) In works of art it is sometimes borne by Zeus, and is a regular attribute of Athena.

ÆGIS'THUS (Gk. *Αἴγισθος, Aigisthos*). The son of Thyestes, adopted son of Atreus. During the absence of Agamemnon at Troy he seduced Clytemnestra, wife of Agamemnon, and on the return of Agamemnon the guilty pair murdered him. Ægisthus was subsequently killed by Agamemnon's son Orestes. The story forms the subject of the Orestean trilogy of Æschylus. See Atreus; Agamemnon; Orestes.

Æ'GIUM (Gk. *Αἴγιον, Aigion*). A town of Achaia, near the coast and west of the mouth of the Selinus River. According to one legend it was the birthplace of Zeus, who was the principal divinity of the place. After the destruction of Helice, Ægium became the chief city of the Achæan League, and the delegates of the league had their place of meeting in a grove near the town. The modern town is Vostitza, officially called by its ancient name.

Æ'GLE, ē'glė (Gk. *Αἴγλη, Aiglē,* Radiance, a Greek divinity). A genus of plants of the natural order Rutaceæ. Ægle marmelos, the tree which produces the *bhel* fruit of India, has ternate, petiolate, oblong-ovate leaves, and the flowers in panicles. It is found from the south of India to the base of the Himalaya Mountains. The fruit is delicious, fragrant, and nutritious. In an imperfectly ripened state it is an astringent of great effect in cases of diarrhœa and dysentery, and as such has lately been introduced into English medical practice. The root, bark, and leaves are also used as medicinals. The Dutch in Ceylon prepare a perfume from the rind of the fruit, and the mucus of the seed is employed as a cement for many purposes.

Æ'GOSPOT'AMOS (Gk. *Αἰγός, Aigos,* gen. of *αἴξ, aix,* she-goat + *ποταμός, potamos,* river). A river and town on the eastern coast of the Thracian Chersonese. The Lacedæmonians under Lysander here surprised and captured the



WESTERN PEDIMENT OF THE TEMPLE OF PALLAS AT ÆGINA.

Athenian fleet in 405 B.C., and thus brought the Peloponnesian war to an end. The name is also written Ægospotami. The ancient town was near the modern village of Jumaliköi.

ÆGYP′TUS (Gk. Αἴγυπτος, *Aigyptos*). In Greek legend, a brother of Danaüs and King of Arabia, who conquered the region to which he gave the name of Egypt. His fifty sons pursued their fifty cousins, the daughters of Danaüs, to Argos; and, with the exception of Lynceus, were murdered by their brides. See DANAÜS; EGYPT.

ÆLFRIC (ăl′frĭk) **THE GRAMMA′RIAN** (about 950-1021). The author of some of the best Old English prose extant. The only material—and it is slight—for constructing the life of this scholar is contained in his own works. The place of his birth is unknown, but the date of it must have been somewhere between 950 and 955. After studying with a poorly educated "mass-priest," he entered the Benedictine school at Winchester (about 972), where he remained "many years." In 987, then "a monk and mass-priest," he was summoned to rule over the abbey of Cernel in Dorset. There he was engaged in preaching and in giving instruction to monks and to young men. Afterward, probably in 1006, he was made abbot of Eynsham, in the valley of the Thames above Oxford. It is conjectured that he died between 1020 and 1025. Ælfric is best known by his *Homilies*, written in pure and vigorous English. Among his other works are: *A Treatise on the Old and New Testaments*, the *Heptateuchus*, an abridged translation of the first seven books of the Old Testament, a Latin grammar and glossary, written in English for the boys of England, and the *Colloquium*, which was designed to teach them to speak Latin correctly. Because of these last two books he is accorded the title of grammarian. For the best account of Ælfric and a bibliography of his works and of critical editions, consult C. L. White, *Ælfric*, a new study of his life and writings, in *Yale Studies in English* (Boston, 1898).

ÆLFTHRYTH, ălf′thrĭth (Latinized *Elfrida*) (c. 945-1000). An Anglo-Saxon queen, mother of Æthelred II. Her first husband was Æthelwald, the ealdorman of the East Anglians, and after his death she married King Eadgar, the father of Æthelred II. She is said to have instigated the murder of her stepson, Eadward, at Corfe, in order to secure the accession of Æthelred II.

Æ′LIA CAP′ITOLI′NA. The name given to Jerusalem by the Emperor Hadrian (Ælius Hadrianus), who expelled the Jews after the insurrection of 132-135 A.D., and colonized the city with Romans. The name continued until the time of the Christian emperors.

Æ′LIA GENS. One of the plebeian gentes (see GENS) at Rome, to which belonged Ælius Sejanus, and the emperors Hadrian and the Antonines. It included also, among others, the families of Gallus, Lamia, Pætus, and Tubero.

Æ′LIA′NUS, CLAUDIUS. A writer who was born at Præneste in Italy and flourished about 200 A.D. He wrote exclusively in Greek in an entertaining fashion, but the information contained in his writings was drawn most uncritically from the works of his predecessors. His extant writings are: *On the Nature of Animals*, in seventeen books, filled with curious accounts of the nature and ways of animals, and with moral reflections on the same, and his *Miscellanies* (*Varia Historia*), in fourteen books. This is preserved only in an abbreviated form, and is almost wholly a collection of anecdotes and marvelous tales relating to men. The twenty *Rustic Letters* current under his name are generally reckoned spurious. His works are best edited by Hercher (1858 and 1864); the editions of the *Varia Historia*, by Perizonius (1701), and *De Animalium Natura*, by Jacobs (1831), deserve mention.

AËL′LO (Gk. 'Αελλώ, storm-swift, from ἄελλα, *aëlla*, whirlwind). In Greek mythology, the name of one of the Harpies (q.v.).

AELST. See ALOST.

AELST, älst, EVERT VAN (1602-58). A Dutch painter of still life, which he depicted with great care and close fidelity to nature. He was, however, surpassed by his nephew, William Van Aelst (1626-83), who is especially noted for his skill in reproducing the lustre of gold, silver, crystal, and mother-of-pearl.

Æ′LUROI′DEA. See CARNIVORA.

ÆMIL′IA. A division of Italy. See EMILIA.

ÆMIL′IA GENS. A famous patrician gens at Rome (see GENS), to which belonged the family of Æmilius Lepidus, Mamercus, Paulus, Scaurus, and other well known names.

ÆMIL′IAN WAY (Lat. *Æmilia Via*). A national highway in ancient Italy. It was built by the consul Marcus Æmilius Lepidus, in 187 B.C., to afford easy communication with Transpadane Gaul, as a part of the great centralizing schemes of Rome in her imperial march northward. It began at Ariminum (Rimini) by the Adriatic Sea, where the Flaminian Way terminated, and ran through Bononia (Bologna) to Mutina (Modera) and Parma, crossed the Po at Placentia (Piacenza), and ended at Mediolanum (Milan). Its total length was about 185 miles.

ÆMIL′IUS PAU′LUS (second century B.C.). A Roman general, son of the consul Æmilius Paulus, who fell in the battle of Cannæ, 216 B.C. Young Æmilius inherited his father's valor and enjoyed an unwonted degree of public esteem and confidence. In 168 B.C. he was elected consul for the second time, and intrusted with the war against Perseus, King of Macedon, whom he defeated in the battle of Pydna, which left Macedonia a Roman province.

ÆNE′AS (Gk. Αἰνείας, *Aineias*). The hero of Vergil's *Æneid*. He was, according to Homer, the son of Anchises and Aphrodite (Venus), and was ranked next to Hector among the Trojan heroes. The traditions of his adventures before and after the fall of Troy are various and discordant. Vergil gives the following version: Æneas, though warned by the ghost of Hector in the night when the Greeks entered Troy to take his household gods and flee from the city, remained in the contest until Priam fell, when, taking with him his family, he escaped from the Greeks, but in the confusion of his hasty flight lost his wife, Creüsa. Having collected a fleet of twenty vessels, he sailed to Thrace, where he began building the city of Ænos, but was terrified by an unfavorable omen, and abandoned his plan of a settlement here. A mistaken interpretation of the oracle of Delphi now led him to Crete, but from this place he was driven by a pestilence.

Passing the promontory of Actium, he came to Epirus, and then continued his voyage to Italy and round Sicily to the promontory of Drepanum on the west, where his father, Anchises, died. A storm afterward drove him to the coast of Africa, and landing near Carthage, he was hospitably received and entertained by Queen Dido. His marriage with Dido was prevented by Jupiter, who sent Mercury with a command that Æneas must proceed to Italy. Accordingly, he sailed away, leaving the disappointed queen, who committed suicide. During his stay in Sicily, where he celebrated the anniversary of his father's death with games, the wives of his companions and seamen, weary of long voyages without certainty of finding a home, made an attempt to burn his fleet. After building the city of Acesta, he sailed for Italy. On landing there he visited the Sibyl at Cumæ. She conducted him into the infernal regions, where he saw Anchises, and received intimations of his future destiny. Then, sailing along the Tiber, and landing on the east side of the river, he found himself in the country of Latinus, king of the Aborigines. Lavinia, the daughter of Latinus, had been destined to marry a stranger, but her mother had promised to give her in marriage to Turnus, king of the Rutuli. She married Æneas, and war ensued, which terminated in the death of Turnus. Æneas Silvius, the son of Æneas by Lavinia, as the ancestor of the kings of Alba Longa, and hence of Romulus and Remus, was regarded as the founder of the Roman State. See ROME.

ÆNE'AS SIL'VIUS. See PIUS II.

ÆNE'ID (Lat. *Æneis*). Vergil's great epic, in which the ancestry of Rome is traced to Troy. See VERGIL.

ÆNESIDE'MUS (Gk. Αἰνησίδημος, *Ainēsidēmos*) (?80-60 B.C.). A Greek philosopher of Alexandria, a contemporary of Cicero. He was born at Cnossus, in Crete. He is well known as the probable author of the *Ten Tropes*, which Sextus Empiricus enumerates, saying that they had become traditional property of the skeptics (q.v.) of his day. Tropes (Gk. τρόποι, *tropoi*) are methods of proving the validity of skepticism. These arguments are based (1) on differences in the constitution of sentient beings, which involve differences in perceptions and conceptions of the world; (2) on differences of human beings; (3) on differences of sense-organs; (4) on differences in circumstances under which perception occurs; (5) on differences of location and distance of objects perceived; (6) on the confusion of one object with another; (7) on differences in a sensation due to different combinations in which it appears; (8) on the relativity of knowledge in general; (9) on differences in perception due to familiarity or unfamiliarity with the object; (10) on differences observed between the civilizations, morals, laws, superstitions, and philosophical theories of different peoples. See RELATIVITY, LAW OF.

ÆNIA'NES. An Achæan tribe of northern Greece. In historic times they lived in the mountains west of Thermopylæ. They were members of the Delphian Amphictyony and of the Ætolian League.

Æ'NON (explained in the New Testament as "many springs"). A locality mentioned in John iii : 23 as a place where John the Baptist was baptizing. It is characterized as being "near Salim" and as having an abundant water supply. Two sites have been proposed as complying with this description. (1) A town called Ainun, in the valley that leads up toward Shechem, about seven miles from the ancient town of Salem, where there are extensive ruins and many springs. (2) On the basis of statements in Eusebius and Jerome, a place called Silvia (=Salem?), about eight Roman miles south of Scythopolis, the old Bethshean. The former identification seems preferable.

ÆO'LIAN ACCU'MULA'TIONS (from *Æolus*, the god of the winds). Dust, fine particles of soil, and even sand grains of a diameter of two millimeters are transported by the wind and brought together in sheltered places, in much the same manner as these particles are transported and deposited by water. Such æolian accumulations occur in both humid and arid regions, though they attain a more pronounced degree of development in those regions of litle rainfall, where the scant vegetation permits the usually powerful winds to exert a considerable erosive action upon the much weathered rocks and dry soil. In humid regions deposits of this nature may be found along the coasts of seas and ocean and also upon upland plains, where the superficial layers of the earth's crust consist of loose sand that may be easily blown away, to be accumulated elsewhere as sand-dunes. In arid regions, dust and sand are being continually transported and deposited in distant places, there to form æolian deposits which are often of considerable geological and also of economic importance. Desert sands traverse wide areas, burying vegetation that may be in the way, even sometimes destroying forests. On the other hand, the fine calcareous dust blown over the prairies of the west settles in the grass and adds to the fertile covering of soil. The fertility of many regions of the Missouri Valley is undoubtedly due to these wind-deposited soils, which are known under the name of "loess;" some of the loess is, however, of aqueous origin. Æolian accumulations have been recognized also in ancient rock formations of various geological systems, notably the Cambrian, Devonian, Jurassic, etc. For description of the erosive and transporting power of wind, and for the characters and distribution of the various kinds of æolian deposits, see the articles on DESERT; DUNE; SAND; SHORE; WIND; and GEOLOGY, paragraph on *Wind Work*.

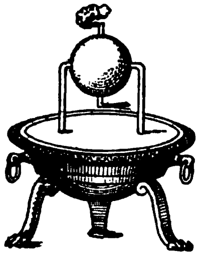
ÆOLIAN HARP. A musical instrument, consisting of a number (usually 8 or 10) of catgut strings of varying thickness tuned to produce the same fundamental tone, and stretched over a narrow, oblong box. When placed in a current of air the Æolian harp produces full chords, composed of the harmonics of the common fundamental. The sounds change from a breezy, fairy-like pianissimo to an imposing forte, which again dies away with the passing of the gust. For illustration, see MUSICAL INSTRUMENTS.

ÆOLIAN ISLES. See LIPARI ISLANDS.

ÆO'LIANS (Gk. Αἰολεῖς, *Aioleis*). The name borne by the Greeks of the island of Lesbos and the coast of Asia Minor north of Cyme. They traced their descent to a mythical Æolus of Thessaly. Later writers extended the name so as to include all races not Dorian or Ionian.

The stories of the *Iliad* seem to have originated among the Æolians. At the end of the seventh century B.C., on the island of Lesbos, in the poems of Alcæus and Sappho, the personal lyric reached its highest development. The Æolians shared the fate of the other Grecian colonies in Asia Minor. First tributary to the Lydian kings, then subjected to the domination of the Persians, they became a portion of the great empire founded by Alexander, and after passing through a stage of subjection to the dynasty of the Seleucidæ, were ultimately absorbed in the Roman Empire. See LYRIC POETRY.

ÆOL'IPILE, or **ÆOL'IPYLE** (commonly explained as from Lat. *Æoli pila*, the ball of Æolus). An invention of Hero of Alexandria, often described as the first steam engine. It consists of a hollow metal sphere mounted on trunnions, through one of which steam is introduced. Short bent tubes issue from this ball at diametrically opposite points, from which steam escapes and causes the globe to revolve. A similar device can be used when the globe is filled with water or alcohol, as a blow-pipe for lamp flame. Consult: Gerland and Traumüller, *Geschichte der Physikalischen Experimentierkunst* (Leipzig, 1899), for a description of this and other early apparatus; also W. Schmidt, *Heron von Alexandria* (Leipzig, 1899). It is also described in R. H. Thurston's *Growth of the Steam Engine* (New York, 1878).


HERO'S ÆOLIPILE.

Æ'OLIS (Gk. Αἰολίς, *Aiolis*). A district on the west coast of Asia Minor, extending from the Hellespont to the river Hermus. There were about thirty Greek cities in this district, of which twelve in the southern part formed a league in early times.

Æ'OLUS (Gk. Αἴολος, *Aiolos*). (1) A friend of the gods and controller of the winds. In the *Odyssey* he rules a floating island. In the *Æneid* he keeps the winds confined in a cave and releases them as he wills. He was also supposed to dwell in a vast cave in the Æolian Islands, keeping the winds in bags, and letting them out as demanded by Poseidon. (2) Son of Hellen, brother of Dorus, and father of Sisyphus. He ruled in Thessaly, and is said to have been the founder of the Æolic branch of the Greek race. Originally both (1) and (2) were probably the same.

Æ'ON (Gk. αἰών, *aiōn*, an age, long space of time, eternity). A term used by the Gnostics, in a peculiar sense, to designate powers that had emanated from God before the beginning of time, and existed as distinct entities or spirits. They were called æons either as partaking of the eternal existence of God or because they were thought to preside over the various ages and transformations of the world. See GNOSTICS.

AEPI'NUS, FRANZ MARIA ULRICH THEODOR (1724-1802). A German physicist, born at Rostock. He first studied medicine, but afterward devoted himself to physics, of which he became professor in St. Petersburg in 1757. He discovered the electric properties of the mineral tourmaline, improved the microscope, and performed numerous original experiments in frictional electricity and magnetism, devising the method of magnetizing known as "double touch." He, in common with Benjamin Franklin, held the single fluid theory of electricity, in opposition to many men of his time who believed that there were two kinds of electricity. He published *Tentamen Theoriæ Electricitatis et Magnetismi.* Catharine II., Empress of Russia, made him teacher to her son Paul and inspector-general of the normal schools which she proposed to establish.

ÆPYOR'NIS (Gk. αἰπύς, *aipys*, high + ὄρνις, *ornis*, bird). An extinct group of ratite birds which inhabited Madagascar within recent, but undetermined, geological time, and ten species of which are known from fossil remains; no evidence exists that it survived to the time of man, although it is frequently referred to as the "roc." It resembled an ostrich in general structure and appearance, but was perhaps taller, and had no wings suitable for flight, resembling in this respect its close still living ally, Apteryx, and the extinct Dinornis and Megalapteryx, of New Zealand. Many of its huge eggs have been exhumed from the drifting sands of southern Madagascar. They measure about nine by thirteen inches, and are very large proportionately, since they are double the dimensions of ostrich eggs, and much exceed those of the moa. For a circumstantial account of the collecting of its bones and eggs, in Madagascar, see *Proceedings Zoölogical Society of London* (1894).

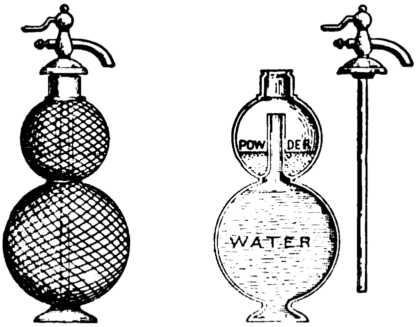
Æ'QUI. An ancient warlike tribe of central Italy, obstinate enemies of the early Romans, against whom they made alliances with the Volsci. They were defeated by Camillus, 389 B.C., and in 304 B.C. were finally subdued. Mount Algidus was one of their strongholds, whence they raided on Rome.

ÆRA'RIANS (Lat. *ærarii*, persons pertaining to the treasury, *ærarium*, i.e., paying taxes, but having no rights). A class in early Rome having no social position now definable and having no civil rights beyond the mere protection of the state. For bad conduct any citizen might be degraded to this condition, but not for life. Persons declared infamous became of this class, and it probably included itinerant retail merchants. They were taxed, but were not subject to military service.

ÆRA'RIUM (Lat., from *æs*, bronze, money). The public treasury of ancient Rome, containing the money and accounts of the state. The temple of Saturn, at the foot of the Capitol, was the place of deposit. Besides this common treasury, replenished by general taxes and charged with ordinary expenditures, there was a reserve treasury, maintained by a tax of 5% on the value of manumitted slaves, which was not to be resorted to or even entered except in extreme necessity. In addition to the treasuries, the Emperor had a *fiscus*, or separate exchequer. Augustus established a military treasury to contain all money for the maintenance of the army. Later emperors had separate private ærariums, containing the moneys appropriated to their private use.

A'ËRA'TED BREAD. See BREAD.

AËRATED WA'TERS. Waters impregnated with carbon dioxide gas, and frequently containing mineral salts. Such waters are extensively used to quench thirst, and are commonly called soda waters. The carbonic acid used in making the common artificial aërated waters is prepared by treating a mineral carbonate, as chalk or lime-stone, with dilute sulphuric acid. The gas thus obtained is forced into bottles or siphons containing water, yielding a brisk, sparkling liquid with a pungent but pleasant acidulous taste. Artificial waters, similar to seltzers, vichy, and other well known mineral waters, are produced by dissolving the known ingredients of the mineral water in distilled water and then impregnating them with carbon dioxide gas. The carbonic acid water mixed with fruit syrups is the ordinary soda water of the pharmacy. Formerly carbonic acid water was made on a small scale in an apparatus called a gazogene or seltzogene (see accompanying figure), in which sodium bicarbonate was decomposed by tartaric acid in the presence of water. A recent invention is the use of capsules containing liquefied carbon dioxide. The liquid which it is desired to impregnate with the gas is placed in a specially constructed bottle, the top of which is provided with a receptacle for the capsule containing the liquefied gas; the covering of the capsule is then ruptured, setting free the acid, which is absorbed by the liquid in the bottle. Aërated waters may also be said to occur naturally, for water taken from a spring contains gases, such as oxygen, nitrogen, and carbon dioxide, dissolved in it. Similarly, running waters, such as rivers and rain waters, absorb gases from the atmosphere, which may be expelled by boiling. See *A Treatise on Beverages*, by C. H. Sulz, and the articles, CARBONATED OR ACIDULOUS WATERS, and MINERAL WATERS.



A'ËRA'TION (Lat. *aër*, air). In botany, the exchange of gases between living plant tissue and the surrounding medium. This exchange is manifested by two processes. In one of these, viz., the manufacture of certain foods (see PHOTOSYNTHESIS), carbon dioxide is required by the plant and oxygen must be eliminated. On the contrary, in the other process, viz., respiration (q.v.), oxygen is necessary and carbon dioxide must be eliminated. The former process is confined to green plants; the latter is essential to all except a few of the lowest and simplest type (anaerobic bacteria). Among the smaller plants, and those whose bodies are made up of interwoven filaments (Fungi), the gaseous exchanges can take place directly, since almost every part of the body is in contact with the air or with water. In the former case, the outside gases dissolve in the constituent water of the cell-wall and are then free to enter; or, arising within the cell, and being already dissolved, they pass off into the air. In water plants the free inward or outward migration of dissolved gases depends on the relative amounts inside and outside the body. (See ABSORPTION.) In the larger land plants the greater number of cells and the more compact structure make it impossible for the cells more distant from the surface to conduct the necessary changes at an adequate rate. Such plants have therefore developed an extensive aërating system (fig. 1), consisting of irregular passages, *i*, between the interior cells, which communicate with the outer air through microscopic openings, *s*, between the surface cells (see STOMATA), or through larger breaks in the corky layers of tissue on the surface of the stems. (See LENTICELS.) The intercellular passages and stomata are formed by the partial separation of the cells as they mature. In land

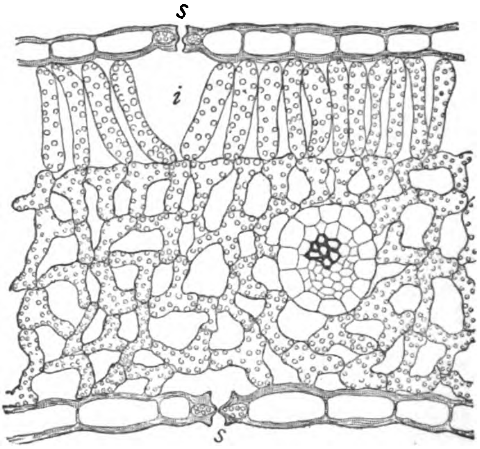


FIG. 1.

Diagrammatic cross-section of a leaf, showing the intercellular spaces in the interior, *i*, and in the epidermis (= stomata), *s*.

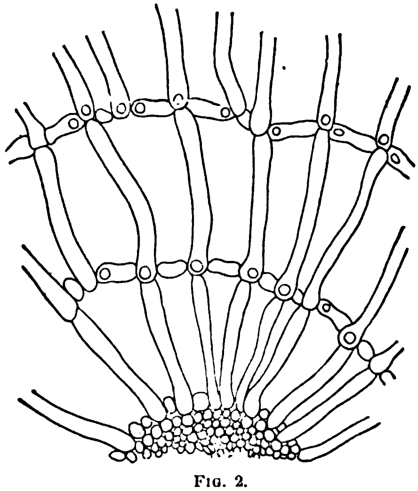


FIG. 2.

Part of a cross-section of the root of Jussiæa, showing aërenchyma, with enormous intercellular spaces, the cells being a mere scaffolding between the surface (not shown) and the central cylinder (at the lower margin).

plants they are most abundant, and largest in the green parts, because the gas exchanges in food-making, photosynthesis, exceed those in respiration. In water plants, however, whose opportunity for securing gases from the air is more limited, the aërating system reaches its highest development. (See HYDROPHYTES.) The tissues may present to the eye a spongy appearance, and in some cases the canals in stems and leafstalks may even be large enough to be easily seen with the naked eye (fig. 2). The internal atmosphere pervading these canals is voluminous enough to permit both considerable exchanges between it and the adjacent tissues and the freer diffusion of gases entering from the restricted area of organs exposed to the air. The composition of the internal atmosphere is always different from that of the outer and varies from time to time. During the day the internal atmosphere contains less carbon dioxide and more oxygen than the external atmosphere, at night the reverse being the case. At all times the internal atmosphere contains a larger amount of water vapor, because the wetness of the cell-wall, which is necessary for gaseous exchanges, permits evaporation. See TRANSPIRATION.

A'ËRA'TOR (Literally, "airer," from Lat. *aër*, air). In dairying, an apparatus for aërating milk to remove the animal and barn odors. The milk is usually caused to run or ripple in a thin layer over an exposed surface, being, in many forms of apparatus, cooled at the same time. In some forms of apparatus the cooling is effected by the use of ice; in others, ice water or cool water from wells or springs is used. The object of cooling milk is to remove the animal heat from it as soon as possible after it is milked, so that the conditions may be less favorable to the growth of the micro-organisms which cause souring and other changes. Cream also is often cooled when it is to be sold for household purposes, especially separator cream. Cooling is, further, a very important step in the process of pasteurizing milk or cream. The practice of aërating and cooling is comparatively new.

AËRENCHYMA, ā'ĕr-ĕŋ'kĭ-ma̍ (Gk. *ἀήρ*, *aër*, air + *ἔγχυμα*, *enchyma*, infusion, in the sense of a tissue). In plants, a loose, spongy tissue, which is especially common in water plants (see HYDROPHYTES), and which is supposed to facilitate aëration—whence the name. Aërenchyma is typically composed of more or less radially arranged arms of thin-walled cells inclosing large air spaces. For illustration, see AËRATION, fig. 2.

AË'RIAL FAU'NA. See DISTRIBUTION OF ANIMALS.

AËRIAL PLANTS AND ROOTS. See EPIPHYTES; ROOTS.

AËRIAL POI'SONS. See MIASMA.

AËRIANS, ā-ē'rĭ-*a*nz. A Christian sect founded in the fourth century by Aërius of Pontus. He opposed prayers for the dead and the keeping of Easter and all set fasts, and asserted the equality between a bishop and a presbyter. John Glas (q.v.) wrote a scholarly monograph on the so-called heresy of Aërius (Perth, 1745), which so strikingly antedates Reformation doctrine.

A'ËROCLI'NOSCOPE (Gk. *ἀήρ*, *aër*, air + *κλίνειν*, *klinein*, to incline + *σκοπεῖν*, *skopein*, to watch, examine). An instrument invented by Buys Ballot and used in Holland and elsewhere as a storm signal. It consists of a vertical axis, turning on a pivot, and carrying at the top a horizontal arm whose inclination can be varied. One end of this arm is painted red and the other white, and when weather conditions are normal it rests at a horizontal position. In case of falling barometer the arm is rotated so that the red end points in the direction of the storm, the amount of inclination indicating the degree of change in the barometer.

A'ËRODYNAM'ICS (Gk. *ἀήρ*, *aër*, air + *δύναμις*, *dynamis*, power). That branch of science which treats of the properties of air and other gases in motion. It is, therefore, a branch of pneumatics.

A'ËROLITE (Gk. *ἀήρ*, *aër*, air + *λίθος*, *lithos*, stone), METEORIC STONE, FIREBALL, URANOLITH, or SHOOTING-STAR. A solid body reaching the earth from unknown points beyond the earth's atmosphere. When seen at night, aërolites usually consist of a luminous head or fireball, followed by a bright train of incandescent matter. Sometimes there are visible explosions, and even loud detonations are occasionally heard. In the daytime the light of both fireball and train is largely lost against the sky background; it is said, however, that visible clouds at all times replace the luminous train.

There are numerous records and stories in all ages and countries of the fall of stones from the sky, but until comparatively recent times they were treated by scientific men as instances of popular credulity and superstition. It was not till the beginning of the nineteenth century that the fact was established beyond a doubt. According to Livy, a shower of stones fell on the Alban mount, not far from Rome, about 654 B.C. The fall of a great stone at Ægospotami, about 467 B.C., is recorded in the *Parian Chronicle* (see ARUNDEL MARBLES), and by Plutarch and Pliny. It was still shown in the days of Pliny (died 79 A.D.), who describes it as the size of a wagon and of a burned color. In the year 1492 A.D. a ponderous stone weighing 260 pounds fell from the sky near the village of Ensisheim, in Alsace; part of it is still to be seen in the village church. An extraordinary shower of stones fell near L'Aigle, in Normandy, on April 26, 1803. The celebrated French physicist, M. Biot, was deputed by the government to repair to the spot and collect the authentic facts, and since the date of his report the reality of such occurrences has no longer been questioned. Nearly all the inhabitants of a large district had seen the cloud, heard the noises, and observed the stones fall. Within an elliptical area of seven miles by three, the number of stones that had fallen could not be less than two or three thousand; the largest were seventeen pounds in weight. These are only a few out of hundreds of instances on record.

As is natural with objects of such mysterious origin, meteoric stones have always been regarded with religious veneration. At Emesa, in Syria, the sun was worshipped under the form of a black stone, reported to have fallen from heaven. The holy Kaaba of Mecca, and the great stone of the pyramid of Cholula, in Mexico, both have a similar history. The existence of such bodies once admitted led to assigning a meteoric character to strange ferruginous masses found in different countries, and which had no history, or were only adverted to in vague tradition. Of this kind is the immense mass seen by Pallas in Siberia, now in the Imperial Museum in St. Petersburg. The largest aërolite known is probably the immense mass called Ahnighito ("the Tent"), which was discovered by Lieutenant Peary, in 1894, near Melville Bay, 30 miles east of Cape York, in northern Greenland. With it were two smaller ones known, respectively, as "the Woman" and "the Dog." The three masses had long been used by the Esquimaux as a source of iron for the manufacture of knives and other weapons, and were supposed to have been hurled from the heavens by the evil spirits. The dimensions of Ahnighito are as follows: length, 11½ feet; width, 7½ feet; thickness, 3½ feet. Its weight is 37½ tons. It was brought to New York with its two companions in 1897, and since 1904 has rested under the entrance arch of the Museum of Natural History. Its nearest rival is Bacubirito, a huge mass discovered half-buried in the ground near the old mining town of Bacubirito, in the state of Sinaloa, Mexico. Its weight is said to be fifty-one tons, but as the mass has never been raised from the place where it originally fell, no correct measurements of its dimensions have been possible, and its weight has doubtless been overestimated.

One constant characteristic of meteoric stones is the fused black crust, like varnish, with which the surface is coated. This coat is very thin and is separated from the inner mass by a sharply defined line. It is due to the action of heat generated by the rapid motion of the meteor through the atmosphere. The specific gravity of meteoric stones ranges from two to seven or eight times that of water. Chemically they have the same composition as our earth, the chief constituent being nickel-iron, which occurs in variable proportions. No new element has been found in them, and only about twenty-five of those already known. But these old elements are often combined in the form of minerals not yet known on the earth.

Besides these solid masses of considerable size, numerous instances are on record of showers of meteoric dust over large tracts of land. See DUST.

Fireballs and Shooting-stars.—From their height and apparent diameter, the actual diameter of the largest fireballs was estimated by Humboldt to vary from 500 to 2800 feet; others allow a diameter of about a mile. In most cases of luminous meteors, a train of light many miles in length is left behind. One or two instances are on record where the train of the fireball continued shining for half an hour after the body disappeared. This remarkable phenomenon is as yet unexplained; it cannot be attributed reasonably to incandescence due to heat alone. The *heights* of shooting-stars are found to average from 74 to 50 miles at the points at which they begin and cease to be visible. Their *velocities* vary from 18 to 36 miles in a second.

One of the most remarkable facts connected with shooting-stars is, that certain appearances of them are *periodic*. On most occasions they are *sporadic*—that is, they appear singly, and traverse the sky in all directions. At other times they appear in swarms of thousands, moving parallel; and these swarms are periodic, or recur on the same days of the year. Attention was first directed to this fact on occasion of the prodigious swarm which appeared in North America between November 12 and 13, 1833, described by Professor Olmsted, of New Haven. The stars fell on this occasion like flakes of snow, to the number, as was estimated, of 240,000, in the space of nine hours, varying in size from a moving point or phosphorescent line to globes of the moon's diameter. The most important observation made was that they all appeared to proceed from the same quarter of the heavens, the vicinity, namely, of the star γ, in the constellation Leo; and although that star had changed greatly its height and direction during the time that the phenomenon lasted, they continued to issue from the same point. It was afterward computed by Encke that this point was the very direction in which the earth was moving in her orbit at the time. Attention being directed to recorded appearances of the same kind, it was observed with surprise that several of the most remarkable had occurred on the same day of November, especially that seen by Humboldt at Cumana in 1799, and by other observers over a great extent of the earth. The November stream was again observed in the United States in 1834, between November 13 and 14, though less intense. Though often vague, and in some years altogether absent, this phenomenon has recurred with such regularity, both in America and Europe, as to establish its periodic character.

Another periodic swarm of considerable regularity is that appearing between August 9 and 14, and noticed in ancient legends as the "fiery tears" of St. Lawrence, whose festival is on the tenth of that month. There are other periodic appearances, and the following epochs are especially worthy of remark: April 20, July 28, August 10, November 14, November 24, December 11.

It remains to notice briefly the various opinions that have been advanced as to the origin of aërolites and the theory of meteors in general. The hypotheses that have been formed in answer to the question, Whence come those solid masses that fall upon the earth? are of two kinds: some ascribing to them a telluric origin, and others making them alien to the earth. Of the first kind is the conjecture that they may be stones ejected from terrestrial volcanoes, revolving for a time along with the earth, and at last returning to it. This, however, is untenable in the face of the phenomena stated above and is now given up. In seeking a source beyond the earth, the moon readily presents itself. Olbers was the first to investigate (1795) the initial velocity necessary to bring to the earth masses projected from the moon. He showed that to account for the actual measured velocity of meteoric stones the original velocity of projection must be no less than 40 or 50 times that of a cannon-ball, which makes the hypothesis improbable.

The discusion of hypotheses as to the genesis of the recognized planets out of portions of the gradually contracting vaporous mass of the sun; the continued discovery of hitherto unobserved planets between the orbits of Mars and Jupiter; the countless multitudes of comets that are observed traversing our system in all directions, and undergoing appreciable alteration both of consistency and orbit—all prepare us for the idea that matter may exist in the interplanetary spaces in every variety of form and condition. To account for the phenomena of meteors as above described, we must suppose that there are both detached masses, each revolving in an independent orbit, and giving rise to *sporadic* meteors, and also connected systems, forming rings or zones around the sun. The intersection of the earth's orbit by such zones or streams would account for the periodic swarms of meteors; and if we suppose the asteroids composing it to be irregularly grouped, we see a reason why the same stream should not be always of equal intensity. There might even be periodicity in this respect too.

What causes the luminous and ignited condition of aërolites? Terrestrial magnetism was at one time suggested as the exciting cause. It is now recognized, however, that the atmosphere extends to a very great height, and the ignition is believed to be caused by friction between the rapidly moving body and the air. As to meteorites that do not fall on the earth, we may suppose that some are merely deflected from their path by the proximity of the earth, are rendered luminous through a short arc, and continue their course with altered orbit, while the greater part are soon burnt up and fall to the earth in impalpable dust. See METEORS.

A'ËROMAN'CY. See SUPERSTITION.

A'ËRONAU'TICS (Gk. *ἀήρ*, *aēr*, air + *ναύτης*, *nautēs*, sailor). The art of aërial navigation. It is of comparatively recent development, as the ancients seem to have been convinced that the navigation of the air was impossible to human beings, and to have made no attempt to accomplish it. A more comprehensible tale than the mythological legend of Dædalus, but yet one which is based entirely on tradition, is that told of the wooden dove invented by the Greek mathematician Archytas, which could maintain sustained flight and was set in motion by "hidden and inclosed air." Passing to the Middle Ages, there are recorded a few actual and usually disastrous attempts at gliding flight, but generally speaking, the consideration of the problem of flight by human beings was confined mostly to surmise and speculations which in many cases were nearly as fanciful as the earlier Grecian fables. The invention which placed the art of aërial navigation upon a more practical basis than mere speculation was the discovery of the balloon.

BALLOONS. The germ of the invention of balloons is to be found in the discovery by the English chemist and physicist, Henry Cavendish, in 1766, of the remarkable lightness of hydrogen gas, then called inflammable air. Professor Black, of Edinburgh, seems to have been the first who conceived the idea that a light envelope containing this gas would rise of itself; but for some reason or other the experiment was never made. The first practical attempts were made by Cavallo, who in 1772 filled swine's bladders and paper bags with the gas, but found the former too heavy and the latter too porous, and only succeeded in raising soap-bubbles inflated with the gas. The invention of the balloon is due to Étienne and Joseph Montgolfier, two distinguished paper-makers at Annonay, in France. It occurred to them, on reading Cavendish's *Different Kinds of Air*, that the air could be rendered navigable by inclosing a light gas within a covering of inconsiderable weight. They first attempted to make balloons of paper filled with inflammable air, but finding that these emptied themselves almost as soon as they were filled, instead of abandoning the paper as an unsuitable covering for the gas, they sought after another gas more suited to the paper. They thought that the gas which resulted from the combustion of slightly moistened straw and wool would answer the purpose, since it had, as they imagined, an upward tendency, not only from its being heated, but from its electrical properties, which caused it to be repelled from the ground. It is hardly necessary to say that this so-called Montgolfier gas possessed no advantages for raising balloons other than that possessed by heated air of any kind; in fact, the abundant smoke with which it was mixed, by adding to its weight, rather detracted from its merits. At Avignon, in November, 1782, Étienne Montgolfier first succeeded in causing a silk parallelopiped, of about 50 cubic feet, to rise to the ceiling of a room. Encouraged by this success, the brothers made experiments on a larger scale at Annonay, and finally, in June, 1783, they raised a balloon 35 feet in diameter to a height of 1500 feet. This balloon, nearly spherical in shape, was made of packcloth, covered with paper, and was heated by a small iron grate placed beneath it, in which ten pounds of moist straw and wool were burned.

A commission was appointed by the Academy of Sciences at Paris to report upon this experiment, but public curiosity, however, could not await the tardy decision of this body, and accordingly a subscription was raised to defray the expense of repeating the Annonay experiment. The construction of the balloon was intrusted to the brothers Robert, famous philosophical instrument makers of the day, and to Professor Charles, a young but experienced physicist. As the detailed account of the Annonay ascent had not reached Paris, and as nothing was therefore known of the Montgolfier gas, Charles fixed upon hydrogen as the gas most likely to insure success. It was, however, a formidable undertaking to produce it in sufficient abundance for a balloon, as it was at that time only prepared in small quantities in the lecture room and laboratory. He, however, succeeded in filling, in the course of four days, a silk globe 12 feet in diameter. This balloon was transferred to the Champs de Mars, where, on August 27, 1783, it ascended in the presence of 300,000 spectators. At the instance of the commission already referred to, Étienne Montgolfier constructed a fire-balloon 72 feet high and 41 feet in diameter. It ascended before the commission on September 12, 1783, but being held captive it was much injured by a violent wind which blew at the time, and after it descended it was finally broken up by heavy rains. Another was made, of nearly the same dimensions, which ascended on the nineteenth of the same month at Versailles, the king and royal family witnessing the spectacle. This ascent is worthy of note, from the fact that a sheep, a cock, and a duck were placed in an osier basket attached to the lower part of the balloon, and that these first aërial voyagers reached the ground again in safety.

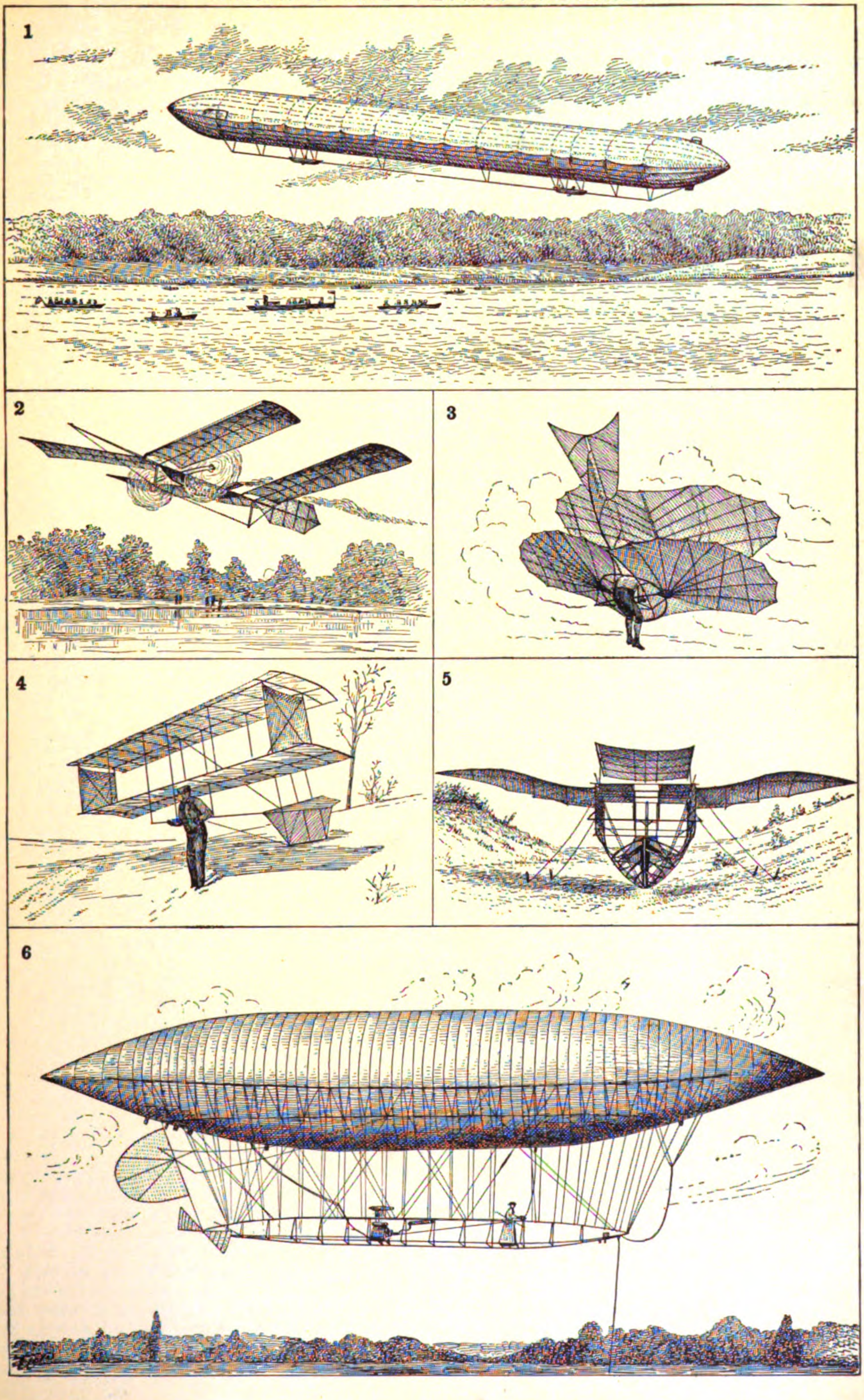
The balloon was now an accomplished fact, and it began to be discussed whether it might not be serviceable as an airship for bearing men aloft as passengers. The solution of this question was first given by Pilâtre de Rozier. In a montgolfière, as the heated air-balloon was called, 74 feet high and 48 feet in diameter, supporting at its base a gallery of wicker-work, he, in company with the Marquis d'Arlandes, made the first aërial voyage, November 21, 1783. They remained in the air twenty-five minutes, and sailed across the Seine and over a considerable part of Paris. The year 1783, so fertile in the annals of aëronautics, witnessed an additional, and even more satisfactory, triumph. On December 1, Professor Charles, along with Robert, rose from the Tuileries gardens with a hydrogen balloon—then called a Charlière—made with the proceeds of a public subscription. This balloon was made of alternately red and yellow gores of silk sewed together and coated with caoutchouc varnish. It was covered with a net which supported the car, and was furnished with a valve, a barometer, and sand-ballast, and was, in fact, a complete aërial machine. In consequence of the danger attending the use of fire-balloons, and the engrossing attention which they demand of the aëronaut, they have now entirely given way to the hydrogen or coal-gas balloons for long voyages. Before they became obsolete several remarkable voyages were made in them. The same Pilâtre de Rozier made 30 leagues in one of them, the longest voyage ever executed in a montgolfière. Among the names of the first professional aëronauts, those of Lunardi, Blanchard, and Garnerin deserve special note. Lunardi was the first who made an ascent in Great Britain; and Blanchard, along with an American, Dr. Jeffries, crossed the English Channel from Dover to Calais in circumstances of almost unparalleled danger, January 7, 1785. Garnerin first descended from a balloon by a parachute (q.v.), October 22, 1797. Pilâtre de Rozier, in an attempt to outvie Blanchard, constructed a compound machine, consisting of a hydrogen balloon above and a montgolfière below, and started from Boulogne, accompanied by a young physicist named Romain, on the morning of June 5, 1785. He had not ascended many minutes when, on attempting to open the valve of the hydrogen balloon by the rope attached to it, he caused a rent of several yards in it, so that it emptied itself almost immediately, and fell on the montgolfière beneath. The fire in the latter not being kindled, the whole machine fell with a frightful rapidity to the earth, and the ill-fated aëronauts perished on the spot whence they had arisen.

Briefly described, the balloon, as it is commonly employed, is a large pear-shaped bag, made of any pliable cloth, usually alpaca or cotton (though silk is the best), covered with a varnish, made by dissolving caoutchouc in oil of turpentine, to render it air-tight. The common size of this bag varies from 20 to 30 feet in equatorial diameter, with a proportionate height. The mouth or neck of this bag is just large enough to enable a man to get inside to make any necessary repairs, and is, of course, turned downward when the balloon is inflated. A network of hempen or cotton twine is accurately fitted to the balloon, and the ends of the separate cords, of which it is formed, are tied to a circular hoop placed a few feet below the neck. The car, generally a large wicker-basket, is suspended by ropes from this hoop and hangs at a considerable distance below, so that the aëronaut may be removed from the vicinity of the gas. The net-work serves to distribute the weight of the car and its charge equally over the whole upper surface of the balloon. One of the most important requisites in the construction is the valve, which is introduced into the top of the balloon. It consists of a wooden or metal clapper, from one foot to three feet in diameter, opening inward, and kept closed by springs. A rope attached to this valve descends through the neck into the car, where, to prevent accidental opening, it is allowed to dangle freely. The equipment of the car comprises the ballast, or sand-bags, by emptying which the balloon may be lightened; the barometer, or corresponding apparatus for telling the height ascended, or the upward or downward course of the balloon; the map and compass, for showing the direction of the voyage; and the grappling-iron, tied to the end of a long rope, for anchoring the balloon at the descent. During his flight the aëronaut has at his disposal the means of guiding his balloon only in an upward or downward direction, the motion of translation being wholly dependent on the wind. If he wishes to ascend, he throws some of the ballast over the side of the car, and if to descend, he pulls the valve-rope, so that, the gas rushing by virtue of its specific lightness through the passage made for it by the open valve, the buoyant material may be lessened. It it evident that the power of thus directing his machine becomes more limited after each discharge of ballast or gas, for, in each case, there is an unrepaired loss of the means necessary to it. In ordinary flights the mouth of the balloon is left open, so that there is no danger of explosion arising from the expansion of the gas in the rarer regions of the atmosphere. The gas most commonly used for balloons is coal gas. The diffusion that takes place through the open neck is inconsiderable during the few hours that an aërial voyage lasts. Early aëronauts, who kept their balloons closed, frequently ran considerable risk by inattention to the valve when the imprisoned gas demanded vent for its expansion.

Captive balloons, as the name signifies, are balloons which are held captive to the earth by means of a cable. The cable is usually arranged to be let out and hauled in by means of a windlass or drum operated by hand or by mechanical power. Captive balloons are much used in military operations and for amusement purposes, and to some extent for scientific observations.

Dirigible balloons are balloons arranged with steering apparatus or propelling machinery by which the direction of their flight can be regulated at will. Important improvements have been made both in the design of the balloons themselves and more especially in the motors, to drive the propellers. The first important and successful experiments were those of M. Gaston Tissandier, with a balloon 91 feet long and 29 feet in diameter, built in the shape of a very thick cigar, with both ends pointed. The envelope was made of thin cloth covered with an impermeable varnish, and from it was hung by means of the usual netting and suspenders a car containing an electric battery supplying current to an electric motor which operated a screw propeller 9¼ feet in diameter and having two blades. A triangular silk rudder was fitted above the propeller in much the same relative position as the rudder of a steamship, and arranged so as to be

AIRSHIPS AND FLYING-MACHINES



1. DIRIGIBLE BALLOON OF COUNT ZEPPELIN, In flight, July 2, 1900.
2. LANGLEY'S AERODROME, In flight.
3. LILIENTHAL'S APPARATUS FOR SOARING FLIGHT.
4-5. CHANUTE'S APPARATUS FOR SOARING FLIGHT.
6. SANTOS-DUMONT'S AIRSHIP.

operated from the car. The total weight of the propelling machinery, the car and the appurtenances, exclusive of 850 pounds of ballast, was 1200 pounds, while the balloon itself weighed 600 pounds. With the propeller making 180 revolutions per minute this balloon was able to maintain its position against a wind blowing 6.8 miles per hour, and when traveling with the wind to deviate to one side or the other with ease. This balloon was followed by one of the French Government, whose construction was suggested by Tissandier's experiments, it being designed by MM. Renard and Krebs on similar lines to, but somewhat longer in comparison with its diameter than, Tissandier's. Seven ascents were made with this balloon during 1884-85, with the following practical results: In five of the ascents the voyagers were able to return to their starting point, and in one instance a velocity of 13 miles per hour was attained independently of the wind.

A notable airship, both for its size and design, was that in which Count Zeppelin made his voyages in 1900. It consisted of a row of seventeen balloons, confined like lozenges in a package, in a cylindrical shell 420 feet long and 39 feet in diameter, with pointed ends. These balloons serve to lift the structure in the air, where it is driven forward or backward by means of large screw propellers operated by benzine motors. A pair of rudders, one forward and one aft, serve to steer the 'airship.' The crew and passengers occupy two aluminum cars suspended forward and aft, below the body of the balloon shell. From these cars, which are connected by a speaking tube, all the machinery of the 'airship' is operated. The 'airship' is made to run on a horizontal or inclined plane by means of a weight, which can be moved back and forth, on a cable underneath the balloon shell. When the weight is far aft, the bow of the ship points upward and the movement is upward; and when the weight is far forward, the movement is downward, and when the weight is exactly in the centre of the ship, the travel is horizontal. The Daimler benzine engines, one in each car, were of 16 horse-power capacity each, and weighed 715 pounds each. The screw propellers, two for each engine, had four blades and were 3¾ feet in diameter. At the first trial of the Zeppelin airship on July 2, 1900, with five persons in the cars, it rose 1300 feet above Lake Constance and traveled 3¾ miles in 17 minutes in the direction desired. An accident to the sliding weight and to one of the rudders caused a descent to be made, which was accomplished with perfect ease. At a succeeding trial on October 17, the airship attained a height of nearly 2000 feet, and there remained poised for 45 minutes. It then made a series of tacks, and described a circle of about 6 miles circumference. The wind exceeded a velocity of about 7 miles per hour, and the airship made headway against this wind for a considerable distance. After remaining in the air for about one hour, the ship descended to the lake with great ease, and was towed to its shed. A third test was also made on October 21. In steering, stability, and equilibrium the tests were pronounced very successful. In 1905 Count Zeppelin made extensive trials of a new airship, in which were incorporated most of the features of the original construction, in addition to many improvements, largely made possible by the decreased weight and increased efficiency of internal combustion motors. Thus the two engines of the 1905 airship were able to supply 170 horse-power at an increase in weight of only 11 pounds, the entire machinery weighing but 880 pounds. Furthermore, the length of the new airship was decreased to 410 feet, and the number of gas compartments was made 16 instead of 17. The cubical contents of the balloon were diminished to 367,120 feet, while the weight to be lifted was smaller by 2200 pounds, amounting to about 19,800 pounds. The propellers on the other hand were of increased size. There were numerous innovations, such as liquid ballast and a complete system of vanes for vertical and horizontal steering. The large size of this balloon makes possible sustained flights, and the carrying of sufficient fuel for long trips, such as 15 to 20 hours.

In 1901, M. Alberto Santos-Dumont, a Brazilian gentleman resident in Paris, excited widespread interest through his experiments with a dirigible balloon. This aëronaut built his first balloon in 1898. It was in the form of a cylinder, terminated at each end by a cone, and was 82 feet long and nearly 6 feet in diameter, with a capacity of 6400 cubic feet. A basket suspended from the balloon carried a 1½ horse-power gasoline motor, which operated a screw propeller. To provide the necessary fore and aft trim for ascent and descent when under way, the inventor made use of bags of ballast which could be attached or removed at will from ropes suspended from the forward and after part of the balloon and accessible from the basket or car. With this balloon M. Santos-Dumont made an ascent in the autumn of 1898 which nearly resulted fatally to himself; the failure of an air-pump to work resulted in a partial collapse of the balloon, which fell 1300 feet to the ground. Aside from the air-pump accident, the success of this trip was unusually encouraging; the balloon proved perfectly dirigible in the light winds prevailing at the time of the trip. A second balloon, built exactly like the first, but larger, was never used by M. Santos-Dumont, owing to the fact that in some experiments made with his first balloon when captive the conclusion had been forced upon him that the model was incorrect. A third balloon, shorter and very much thicker, was completed in the summer of 1899. This balloon was 66 feet long, 11½ feet greatest diameter, and 17,600 cubic feet capacity, and into the construction was introduced the novelty of what the inventor termed a keel. This keel was nothing more or less than a bamboo pole, 30 feet long, fixed lengthwise to suspender cords just beneath the balloon, which supported the basket and other apparatus. M. Santos-Dumont was able to circle around the Eiffel Tower in this balloon but found that it was too clumsy and the motor too weak, and he built a fourth, 95 feet long and 9 feet in diameter, elliptical in shape, with a capacity of 14,800 cubic feet. In this balloon the keel was a long framework of bamboo and wire, which carried directly—there being no suspended car—a 7 horse-power motor with its propeller and other mechanism. The operator managed his machine seated on a bicycle saddle attached to the keel. With this balloon M. Santos-Dumont made numerous short trips during the Paris Exposition of 1900. Balloon No. 5 was made by cutting balloon No. 4 in half and inserting a cylindrical piece sufficient to increase its length to 109 feet. A 16 horse-power motor was adopted. The keel was a 60 foot framework of pine and piano wire, and into it, 20 feet from the stern, was fixed the motor, while the operator occupied a basket 23 feet from the front end or stem. On August 18, 1901, M. Santos-Dumont navigated this balloon from St. Cloud to and around the Eiffel Tower, and was approaching the starting point when the balloon collapsed, and the whole structure, with its operator, was precipitated upon the roof of the Trocadero Hotel, where it hung, the keel spanning the space between the two roofs. The sixth balloon of M. Santos-Dumont was like the previous one, except that it was longer, thicker, and more nearly ellipsoidal in shape. On October 19, 1901, this balloon succeeded in making a trip from St. Cloud to and around the Eiffel Tower, and then back to the starting point, in 30 minutes, 40¼ seconds. The trip was undertaken as the result of a prize of 100,000 francs offered to the inventor should he succeed in making the journey in 30 minutes.

In rapid succession the Brazilian aëronaut has constructed balloons, each embodying some new feature, and in the main marking an advance over its predecessors. In some instances, notably in his No. 9, there was a return to the egg-shaped balloon of Krebs and Renard of 1885, with the larger end first, to give greater resistance to the air. In some cases speed was aimed at, in others, carrying capacity, while the control in each instance was made more complete. In 1905 the Santos-Dumont XIV was finished, a balloon designed for speed. It was 41 metres (134.5 feet) in length and was inflated with pure hydrogen. Its motor consisted of a 14 horse-power Pengot motor, weighing 27 kilograms (59.5 lbs.) and connected with a propeller placed well forward near the motor, so that the airship is drawn rather than propelled. This dirigible balloon was tested at Trowville over the sea and was found to be readily guided and controlled.

Sharing the honors with the airships of Santos-Dumont are those of M. Le Baudy which, all things considered, are thought by many authorities to be the most satisfactory and successful airships where a gas inflated balloon is employed. The 1903 airship consisted of a long and finely pointed balloon containing eighty thousand cubic feet of gas, and constructed with its lower surface flat, around which was a frame of steel tubing, from which the car was suspended. The balloon for this airship was made of two thicknesses of cotton cloth, with india rubber between, and while reasonably light, was quite impervious to the gas. There was also a keel which was made of steel tubing and covered with canvas. Extensive use was made of steel tubes and wire, and for this purpose the new nickel steel alloy, containing 12% of nickel, was employed. Both in the framework and in the machinery there was a solidity and rigidity of construction, and, throughout, all details were developed with a careful consideration of the best engineering principles and practice. The car was a boat-shaped frame of steel, and contained a Mercedes engine of 40 horse-power, driving steel propellers which rotated at a rate of one thousand revolutions a minute. The weight of this airship, including its passengers, was 5700 pounds. In 1903 it traveled on one trip 61 miles, and was in the air 2¾ hours. The best speed recorded was 25 miles an hour, and were it not for the untimely destruction of the airship while resting on the ground in a fierce gale, much more could doubtless have been accomplished. In 1904 a new Le Baudy airship was built, embodying essentially the features of the former, and at the same time taking advantage of the experience gained. In this a motor was used whose weight was only about 7½ kilograms (16½ lbs.) per horse-power, and the consumption of fuel was but 315 grams per horse-power.

An important result of M. Le Baudy's experiments was the demonstration of the advantage of filling the balloon with pure hydrogen gas, as the ascensional force thus produced was about 60% greater than with ordinary illuminating gas. Consequently the gas generated by the action of sulphuric acid on iron was purified by washing and by chemical treatment in order to eliminate the various impurities, including those that tended to increase the specific gravity of the gas. So great was the success of the cotton fabric with alternate coats of india rubber employed in the earlier balloon that it was adopted for the later airships, but it was recognized that silk could be used on account of its greater strength were it necessary to construct a larger balloon. The cloth is colored yellow with the object of protecting the rubber from the actinic effects of the sunlight. The Le Baudy balloon of 1904 was cigar-shaped, with its rear end rounded. It was 57.75 metres (189.5 feet) in length; its maximum diameter was 9.80 metres (32.5 feet), and it had a volume of 2666 cubic metres, which afforded a sustaining capacity for more than three thousand kilograms, or over three tons. This enabled the balloon to lift the structure, machinery, the crew of five men, fuel for seven hours, and 300 to 350 kilograms of ballast. The motor for this airship was a 40 horse-power Mercedes gasolene motor with four cycle cylinders, designed to operate at a normal speed of one thousand revolutions per minute, and susceptible of regulation from 250 to 1200 revolutions per minute. The crank-shaft of the motor was transverse to the axis of the car, and by bevel gearing its motion was conveyed to the propeller shafts running at the same speed. The blades of the propeller had a diameter of 2.44 metres. In the experiments with this airship it was demonstrated conclusively that it could be controlled in windy weather, and could maintain its equilibrium satisfactorily. In 1905 a new Le Baudy airship was constructed, which had about the same length but greater transverse dimensions and capacity of volume of the envelope than that of the previous year, besides having a more powerful motor. This balloon was extensively tested by the French military authorities and furnished a most excellent account of itself. It was desired to try the availability of the airship for scouting and photographic surveying, and in the military ascents made at Toul it was found possible to rise above the fortresses, and to detect all of their features to the smallest detail, while at the same time the balloon could be manœuvred at such a height as to avoid the enemy's fire. This balloon was turned over to the French army, and in 1906 the MM. Le Baudy were commissioned to construct a new airship.

Among the French dirigible balloons mention should be made of the airship constructed for the Wellman Chicago Record-Herald Arctic Expedition. This airship was to be used in a dash for the North Pole from a base in Spitzbergen and was designed to make a speed of about 15 miles an hour on a ten days' trip. It was 164.04 feet in length, with a greatest diameter of 52.49 feet, surface area 21,098 square feet, capacity 224,244 cubic feet. Its lifting power was estimated at 16,000 pounds, and the weight consisted of the balloon, machinery, and steel car, amounting to 6600 pounds, and the crew, instruments, supplies, etc., aggregating 9400 pounds. The contemplated duration of inflation was from 15 to 20 days, and the two motors, of 50 and 25 horse-power respectively, were able to give a speed of from 12 to 15 miles per hour. The suspended steel car was 52.5 feet in length, and contained an enclosed engine-room and cabin, while below there was a steel boat, which not only served as on a working deck for the manipulation of the guide rope, but could be used as a sledge in case of accident to the airship, necessitating a return by foot over the ice or open water to the headquarters.

In the United States many flights have been made by airships of different patterns more or less successfully. In New York, in August, 1905, several trips were made in a dirigible balloon by Roy S. Knabenshue, and again, in the following year, when the assistant of this aëronaut, Lincoln Beechey, twice went around the Washington Monument and the dome of the Capitol, showing how well an airship could be controlled in a calm or in light airs. Another ascent of similar nature was made on July 31, 1905, at Brighton Beach, New York, by Leo Stevens, who was able to navigate at will an airship known as the "California Arrow" and to return to the starting place. In 1905 and 1906 considerable interest was manifested in ballooning in the United States and the Aëro Club of America was formed, which, in January, 1906, held an exhibition at the Sixth Annual Automobile Show in New York. A large number of balloons have been made and used chiefly for sport, though but little of scientific importance or in the way of the practical advance of the art as yet has been accomplished.

High ascents in balloons have been made by a number of aëronauts. On September 5, 1862, two English aëronauts, Messrs. Coxwell and Glaisher, starting from Wolverhampton, England, ascended 37,000 feet, or fully seven miles. At a height of 5½ miles one of the aëronauts became insensible and the other very nearly so; at the height of 4 miles railway trains could be heard, but at a height of 6 miles there was perfect silence. On April 15, 1875, M. Tissandier, the inventor of the dirigible balloon previously described, and two others rose from Paris, France, a height of 5⅓ miles. M. Tissandier alone survived the trip, his companions dying in mid-air, and he himself being rendered unconscious. These are the two highest balloon ascents recorded in which living beings were passengers.

Scientific research by means of balloons has been undertaken in a number of instances, the most notable attempt, perhaps, in recent years being that of the Arctic explorer Andrée to reach the North Pole in the summer of 1897. As is well known, the explorer and his companions perished without accomplishing anything, but in 1906 preparations were being made for a trip to the Pole in the Wellman airship described below. The most fruitful scientific results so far obtained by ballooning have come from the study of the magnetism, humidity, temperature, and chemical composition of the air at high altitudes. The first ascension of any value for these purposes was that of Gay Lussac, in 1804, from Paris. The balloon rose to 23,000 feet, and the fall in temperature was 67° F., or 1° in 340 feet. Specimens of air collected at the highest point showed precisely the same composition as at the earth. The magnetic force did not experience any sensible variation at the different heights. The next ascent of importance was that of Barral and Bixto in July, 1850. In this ascent, at 19,700 feet, the aëronauts observed a temperature in a cloud of 15° F., and at 23,000 feet above the cloud a temperature of —38° F. The ascent of James Glaisher in 1862 has already been noted for its extreme height, and there have been several other ascents of less height from which fruitful scientific results have been obtained. On March 21, 1893, a balloon 19.7 feet in diameter, carrying a self-registering barometer and thermometer, was sent up from Paris. The records made by these instruments were examined when the balloon descended, and appeared to show that the balloon rose to a height of 45,920 feet, when the ink froze at a temperature of —32° C., and the record was discontinued until at a height of 52,490 feet the ink was thawed by solar radiation and the record was resumed. The accuracy of these figures has been seriously questioned, but if they are accurate the balloon reached a height of nearly 10 miles.

The importance of making meteorological observations at high altitudes has led recently to the extensive use of unmanned balloons, *ballons sonde*, which carry recording apparatus to considerable heights, and thus enable a study to be made of atmospheric conditions. These balloons are made of thin rubber and are filled with hydrogen gas, which enables them to reach considerable altitudes, at which the pressure of the gas suffices to burst the envelope of the balloon, while the meteorograph, which is attached to a parachute or second balloon, falls to the ground without injury. It is sufficiently conspicuous to attract attention and it is picked up and forwarded to the station or bureau, from which the balloon was dispatched. While this has been a favorite method of research in Europe for several years, it was not tried in the United States until the fall of 1904, in connection with the St. Louis Exposition, and some of these instruments were carried up to a height of 9 or 10 miles, and recorded temperatures as low as —68° F. These observations were continued in 1905 with considerable success, while in the same year the beginning of a similar set of experiments was made in England. Indeed the importance of this method of observing was recognized at an international conference held in 1904 and arrangements were made for simultaneous international ascents.

The first important test of *ballons sonde* at sea was made in the spring of 1905, by the Prince of Monaco. These balloons, in addition to the essential features, also included some novel characteristics. In some cases two balloons were connected, the lower being charged at a somewhat greater pressure than the upper, so that when it broke, the upper balloon would serve as a parachute, and carry the recording instruments slowly but safely to the surface of the earth. In others an electrical device was provided whereby the lower balloon was cut off or discharged when the barograph registered a certain pressure. The maximum altitude reached by the balloons sent from the Prince of Monaco's yacht was 8900 metres (29.199 feet). and a speed of about 18 feet a second for the ascent. and of about 15½ feet a second for the descent was recorded, while the minimum temperature was —46.3° C. In nearly all cases the apparatus which was supported by a float was recovered by the yacht, and no difficulties were encountered which would prevent the use of this method of exploring the upper air at various points of the Atlantic Ocean. Such information would be of the greatest value to meteorologists in both Europe and America, and would supplement the work of observers on high mountains, and those who are making continuous observations at land stations with balloons and kites.

At the Paris Exposition of 1900, competitive long distance balloon trips were undertaken by a number of aëronauts on September 30 and October 9. In the first trial, or race, as it was popularly termed, there were twelve starters, of which only four succeeded in making records of a notable character. Starting from the Vincennes Field, Paris, Comte de Castillon de Saint-Victor, in the *Orient*, reached Cordof in Schleswig-Holstein, 496 miles, in 14 hours; M. Faure, in the *Aëro-Club*, reached Mamlitz, in Posen, eastern Prussia, 733 miles; M. Jacques Balsan, in the *Saint Louis*, reached Danzig, eastern Prussia, 757 miles, in 22 hours, and the Comte de la Vaulx, in the *Centaure*, reached Wloclawek, in Russian Poland, 766 miles, in 21 hours and 30 minutes. In the second trial of October 9, there were six starters, of whom only two deserve particular mention, namely, the Comte de la Vaulx, in the *Centaure*, and M. Jacques Balsan, in the *Saint Louis*, both competitors in the first trial. Starting from Paris, M. le Comte de la Vaulx reached Korostichev, in Russia, 1193 miles, in 36 hours and 45 minutes. The extreme altitude attained was 18,810 feet. M. Jacques Balsan reached Radom, Poland, 843 miles from Paris, in 27 hours and 25 minutes. The maximum altitude reached was 21,582 feet. The *Centaure* of the Comte de la Vaulx, which made the best record, was a balloon of 1650 cubic meters capacity, and had made several notable ascents previous to its record-breaking voyage beginning October 9, 1900. The most remarkable of these previous voyages was one from Paris to Sweden, 824 miles. In the famous 1193 mile journey to Russia, the *Centaure* was filled with a mixture of hydrogen and of common illuminating gas.

MILITARY BALLOONING. The first use of balloons for this purpose was made under the first French Republic by the chemist Guyton de Morveau, and two companies of military balloonists were organized under the command of De Coutelle and sent to the field. The *L'Entreprenant*, a balloon 27 feet in diameter, was at Maubeuge, June 2, 1794, doing excellent service for the French, and again at Charleroi, from June 21 to 25. The balloons used were of the captive type, held by ropes. During the battle of Fleurus, the *L'Entreprenant* remained ten hours in the air, and gave General Jourdan all details of the Austrian movements. During the Civil War in the United States, La Montain reconnoitred the Confederate position from a captive balloon near Washington, but finding his observations insufficient, he cut the cable which held the balloon and passed over the enemy's army. Landing in Maryland, he was able to afford General McClellan important information concerning the enemy's movements. The balloon *Rhode Island*, also used in the Civil War, was the first used in communicating directly with a military post, by means of a wire conductor attached to the anchoring cable, and thus transmitted observations telegraphically to the ground. Later in the war, from a balloon before Richmond, at an altitude of 300 meters (about 980 feet), panoramic photographs were taken of the *terrain* and surrounding country. In 1870 the Germans before Strassburg made ineffectual attempts to utilize balloons. In this respect the French were more successful, using balloons during the siege of Paris to communicate with the outer world. A school of aërostation was founded in Germany in 1884, under command of Major Buchols. Ascensions were made at the manœuvres near Cologne in 1885, and these experiments were renewed at Mainz in 1887. The German officers also made experiments with luminous balloons for signaling, using an electric lamp in the interior of the balloon. By means of an electric projector carried up by a balloon, they were able to throw light on the *terrain* at a great distance. Optic telegraphy was the subject of experiments and study in Russia in 1884, and trials were made with arc lights suspended under the balloon and connected with the ground by conductors. In 1879 the English organized a company of military balloonists, and a park of construction for balloons was established at Woolwich. In the Egyptian campaign in 1885 military ballooning was used to advantage. The balloon section was used in South Africa, 1899-1901, with some measure of success.

Military ballooning is attracting increased attention among European armies, and in France great interest is manifested in the matter, the tests of the Le Baudy airship already described being among the most important, as here it was found possible to manœuvre and observe at a height beyond the effective range of the enemy's fire. It must be recognized, however, that any possible development in the military use of balloons will be met with special ordnance able to cope with the airship so that the contest will not long be one-sided, if at all.

The balloon was used as an actual means of offense at the siege of Verona. 1849, by the Austrians, who transported in balloons missiles of war, which they threw down upon the enemy. This method of warfare, which has often been proposed, has not been found successful, largely owing to the difficulty in dropping the missiles accurately, slight wind currents deflecting them. Moreover, it was ruled out of civilized warfare by The Hague Peace Conference of 1899.

MECHANICAL FLIGHT. Attempts to imitate the flight of birds by mechanical contrivances antedate the balloon by several hundred years. Several very early instances are on record of persons who. apparently by some parachute-like contrivance, descended obliquely from high towers to a considerable distance; thus in the thirteenth or fourteenth century, Elmerus, a monk, is said to have flown more than a furlong from the top of a tower in Spain, but the distance is probably much exaggerated; and in the seventeenth century, Besnier, a locksmith of Sable, in France, after experiments from windows one story high was able to leap safely from very elevated positions, and to pass over houses or over rivers of considerable breadth. The first properly authenticated account of an artificial wing was given by Borelli in 1670, and his investigations and experiments furnished the principal basis for experiments until 1867. In this year Professor J. B. Pettigrew, an English scientist, published the results of an elaborate and careful series of studies made by him upon the flight of birds, which wrought a revolution in the construction of flying machines. Elastic aëroplanes were advocated by Mr. Brown, elastic aërial screws by Mr. Armour, and elastic aëroplanes, wings, and screws by M. Pénaud. The latter constructed models to fly by three different methods—(1) by means of screws acting vertically upward; (2) by aëroplanes propelled horizontally by screws; and (3) by wings which are flapped in an upward and downward direction. These models were so far successful as to make a considerable degree of progress and offer hints for future guidance. Mr. Henson designed a flying machine in 1841, combining aërial screws with extensive supporting structures. Mr. Wenham, in 1867, thinking to improve upon Mr. Henson, invented what he designated his aëroplanes. Mr. Stringfellow, who was originally associated with Mr. Henson, and constructed a successful flying model in 1847, built a second model in 1868, in which Mr. Wenham's aëroplanes were combined with aërial screws. This model was on view at the exhibition of the Aëronautical Society of Great Britain, held at the Crystal Palace, London, in 1868. It was remarkably compact and light, and obtained the $500 prize of the exhibition for its engine, which was the lightest and most powerful ever constructed. The machine for which it was made was not successful. In 1874 Mr. Moy invented an aërial steamer, consisting of a light, powerful skeleton frame resting on three wheels; a very effective light engine constructed on a new principle, which dispensed with the old-fashioned cumbrous boiler, narrow horizontal aëroplanes, and two very large aërial screws. In its general features Mr. Moy's machine resembled that of Mr. Stringfellow. Recently in France increased attention has been paid to mechanical flight, and in 1906 a form of aëroplane, which resembled a large pair of wings, was brought out by M. Florencie. This orthopter, as this class of machines is termed, consisted of a pair of wings attached to a central frame and moved by the feet of the operator, the wings being lowered by the stretching of the feet and then raised by springs. The apparatus, which is 45 feet in width, weighs but 30 pounds. An application of the vertical screw idea or helicopter was that of M. Leger, who has used in his experiments two vertical screws revolving in opposite directions.

Summarizing the methods of flight so far attempted, we have, therefore, (1) dirigible balloons; (2) those forms of apparatus which were intended to sustain or lift their weight by screw propellers revolving on vertical axes; (3) those machines which were intended to sustain their weight on flapping or beating wings; and (4) the aëroplane or aërocurve contrivances which have been experimented with in recent years, to the practical exclusion of all other classes except the dirigible balloon. To understand the reason for this tendency toward the aëroplane or gliding machine, a brief comparative discussion of the different classes of flying machines is necessary.

As already stated, the future utility of the dirigible balloon is still the subject of differences of opinion. Its chief drawbacks are great bulk and extreme frailty, which seem to affect its practical advantages in other respects. Vertical screw machines have much to recommend them, but they present drawbacks which more than counterbalance the advantages. The ability to rise directly into the air from any given spot would be an exceedingly desirable quality, and hence a great many attempts have been made to develop a successful vertical screw machine. Perhaps the greatest stumbling block to success has been that when the surfaces which form the blades of the screws are revolved over one spot they do not give any considerable lifting effect in proportion to the power consumed. It is stated by high authority that where one might from theory expect a lift of possibly 100 pounds per horse-power, the best result the inventor can produce on a practical scale is almost sure to be less than one-seventh of that figure; in fact, the lift with the lightest engines we can build is likely to be but little if any more than the weight of the machine itself. With engines weighing much more than four or five pounds per horse-power it is asserted that practical success with this type of apparatus is not possible. The third class, or the beating wing machines, are subject to the same disadvantages in regard to the enormous power required as those of the vertical screw type. In addition to this, the problem of maintaining a stable equilibrium in windy weather still further seriously complicates matters so much, that it is considered that there is but small hope of practical machines operated on this principle being produced. In conclusion, it is hardly necessary to point out that any combination in a single machine of the salient features of two or more of the classes of machines described tends to complicate rather than to improve the situation.

After thorough investigation and experiment, the objections to the three classes of machines named, which have been briefly outlined above, appear so formidable to the great majority of the foremost workers for mechanical flight to-day that there now appears to them to be but one principle left, and upon this there is based an increasing hope that flight will be accomplished. This principle is the one which underlies the aëroplane or aërocurve; which is that when a thin surface is drawn through the air and is slightly inclined to its path, the equivalent of a pressure is developed on the side which is exposed to the air current—that is, the under side—which is much greater than the driving force which is necessary to produce it. If a surface arched in the line of the motion be substituted for the plane, we have an aërocurve, whose chief advantage is that it has a higher efficiency. Another advantage is that it is not necessary to incline an aërocurve in order to develop a pressure on the hollow side when it is moved through the air. The one advantage which the power machine of the aërocurve type has over the vertical screw is the fact that it can for the reasons just stated convert the relatively small push of the screw propellers into a much larger lifting effect.

Recent experiments with aërocurves may be divided into two classes: (1) Experiments with models and (2) experiments with large devices capable of carrying a man. Perhaps the two most notable experimenters with models have been Sir Hiram Maxim of England and Professor S. P. Langley of the United States. In a paper written in 1896, Sir Hiram Maxim summarizes some of the principal results of his experiments as follows:

"My experiments have certainly demonstrated that a steam engine and boiler may be made which will generate a horse-power for every six pounds of weight, and that the whole motor, including the gas generator, the water supply, the condensor, and the pumps may be all made to come inside of 11 pounds to the horse-power. They also show that well-made screw propellers working in the air are fairly efficient, and that they obtain a sufficient grip upon the air to drive the machine forward at a high velocity; that very large aëroplanes, if well made and placed at a proper angle, will lift as much as 2½ pounds per square foot at a velocity not greater than 40 miles an hour; also that it is possible for a machine to be made so light and at the same time so powerful that it will lift not only its own weight but a considerable amount besides, with no other energy except that derived from its own engines. Therefore there can be no question but that a flying machine is now possible without the aid of a balloon in any form."

In 1891, Professor Langley published his now famous memoir entitled *Experiments in Aërodynamics*, and in 1893 his equally celebrated book on *The Internal Work of the Wind*. The experiments upon which many of the statements in these books were based were begun in 1887, and from 1891 to 1896 Professor Langley was more or less constantly at work perfecting a model flying machine, which finally culminated in his aërodrome. This machine, which was driven by a steam engine using naphtha as fuel, made a flight of three-quarters of a mile on November 28, 1896.

By the aid of a Congressional appropriation a full-sized aërodrome was constructed and tested in 1903. Its failure was a source of keen disappointment to many, who had believed that in the aërodrome Professor Langley would solve the problem of mechanical flight. The machine embodied not only the best theoretical considerations, but also the results of experiments with models and the best workmanship. Professor Langley, in the *Smithsonian Report* for 1904, describes the apparatus and its trials with considerable detail, and states that the failure was due to difficulty with the launching mechanism. The aërodrome had a sustaining surface of 1040 square feet and with the aëronaut weighed, when ready for flight, 830 pounds. The engine, which was able to furnish 52 brake horse-power, weighed, without fuel or water, 2.2 pounds to the horse-power approximately. The unsuccessful character of two trial flights made in 1903 did not demonstrate that the engine was unable to lift the machine, as the mishaps on both occasions were due to the apparatus catching on the launching apparatus, and this in the second instance resulted in the wreck of the machine. According to Professor Langley, the ability of the aërodrome to fly was still unsettled though it could not be considered a failure in this respect. He also considers that methods successful on a small scale are quite insufficient when experiments of considerable magniture are undertaken. No further developments of the aërodrome were made by Professor Langley before his death and the government appropriations under which they were undertaken were exhausted.

The most valuable sets of experiments conducted with large aërocurves and aëroplanes capable of carrying one man are those of Herr Otto Lilienthal of Germany, Mr. Octave Chanute, an American engineer, and more recently the Wright brothers of Dayton, Ohio. Chanute's experiments, which were practically the same as those by Herr Lilienthal, are described by him as follows:

"The method of carrying on these adventures is for the operator to place himself within and under the apparatus, which should preferably be light enough to be easily carried on the shoulders or by the hands, and to face the wind on a hillside. The operator should in no wise be attached to the machine. He may be suspended by his arms, or sit upon a seat, or stand on a dependent running board, but he must be able to disengage himself instantly from the machine should anything go wrong, and be able to come down upon his legs in landing.

"Facing dead into the wind, and keeping the front edge of the supporting surfaces depressed, so that the wind shall blow upon their backs and press them downward, the operator first adjusts his apparatus and himself to the veering wind. He has to struggle to obtain a poise, and in a moment of relative steadiness he runs forward a few steps as fast as he may, and launches himself upon the breeze, by raising up the front edge of the sustaining surfaces, so as to receive the wind from beneath at a very small angle (2 to 4 degrees) of incidence. If the surfaces and wind be adequate, he finds himself thoroughly sustained, and then sails forward on a descending or undulating course, under the combined effects of gravity and of the opposing wind. By shifting either his body or his wings, or both, he can direct his descent, either sideways or up or down, within certain limits; he can cause the apparatus to sweep upward so as to clear an obstacle, and he is not infrequently lifted up several feet by a swelling of the wind. The course of the glide eventually brings the apparatus within a few feet of the ground (6 to 10 feet), when the operator, by throwing his weight backward, or his wings forward, if they be movable, causes the front of the supporting surfaces to tilt up to a greater angle of incidence, thus increasing the wind resistance, slowing the forward motion, and enabling him, by a slight oscillation, to drop to the ground as gently as if he had fallen only one or two feet."

With the machine shown in the illustration Herr Lilienthal, starting from a height, was able to sail several hundred feet—the flight in some instances being against a wind of 24 miles per hour—and to make turns to the right or left with considerable certainty. Mr. Chanute's experiments were conducted first with a machine like Herr Lilienthal's but with one pair of wings only; second, with a machine having five pairs of wings, one above the other, and a sixth pair forming a tail; third, with a machine consisting of two wings, one above the other, and without any break in the middle, as shown in the first of the two illustrations of his apparatus; and finally with a large bird-like structure of the form shown in the illustration. The greatest success, perhaps, must be credited to the double-winged machine, which made numerous flights, some of them against winds of from 10 to 31 miles per hour. The longest flight made was 359 feet, from a starting point 62 feet higher than the point of landing.

The curved surfaces of Lilienthal and his contemporary experimenters were found less satisfactory than planes, and the most efficient arrangement proved to be a pair of narrow superposed rectangles. Working with such apparatus the most practical achievements with the aëroplane have been those of Messrs. Orville and Wilbur Wright of Dayton, Ohio. After a long series of practical experiments with aëroplanes in gliding flight in which great dexterity of manipulation was obtained, they were able to construct a machine with a front rudder, in which the operator occupied a horizontal position, with which the effects of the wind could be studied. After flying the aëroplanes as kites and testing many forms and designs, a machine eventually was devised, to which a gasolene motor was fitted. This was tested on December 13, 1903, and four successful flights were made, in one of which the aëroplane rose of its own power, was in the air 59 seconds, and travelled a distance of 852 feet. This is considered the first instance where a person has been carried from ground in actual flight by mechanical means without artificial aids. Such success naturally led to other experiments, and on October 5, 1905, the aëroplane made a flight of 24¼ miles, remaining in the air 30 minutes. It was able to carry fuel for an hour's run and was able to move at a speed of about 38 miles an hour. It was readily manœuvred and was entirely under the control of the operator, being brought back to the starting point without difficulty. Detailed descriptions of the machine were not published at the time of the trials, and, in fact, up to the year 1906 the greatest secrecy was maintained about these experiments, but it was said to be a double-decked structure of larch wood, having a frame 40 feet from tip to tip of wings, while the breadth in the widest part was 6 feet. A gasolene motor weighing 40 pounds gave between 15 and 21 horse-power. The weight of the apparatus, including that of the operator, who maintains a horizontal position on the lower plane, was concentrated as much as possible in this plane in order to obtain stability. The operator is able to control flight in both vertical and horizontal directions by the use of steering mechanism. Previous to its flight the aëroplane is mounted on a carriage, which moves along inclined rails until the machine rises in flight and frees itself from its supports.

The success of the brothers Wright as well as an increased interest in aëroplanes led to considerable activity in Paris in 1906, and Santos-Dumont temporarily turned from his dirigible balloons to work with a new form of aëroplane, which differed in many ways from previous machines of this class designed for free flight. This machine was known as the 14 bis, and later as the Bird of Prey, and consisted of a frame carrying a cellular structure, with a box rudder in front, at the end of a vertical vane. There is a two-bladed aluminium propeller, 6.56 feet in diameter, driven by a 60 horse-power eight cylinder gasolene motor and revolving at a speed of 1500 revolutions per minute. The machine, with the operator (Santos-Dumont), weighed 650 pounds and was constructed of bamboo covered with canvas. Its supporting surface was 645 square feet, and the machine could be directed by its operator through the rudder. On a trial trip in September, 1906, this machine collapsed and the aëronaut narrowly escaped with his life. Nothing daunted the Brazilian aëronaut repaired the damage and continued his experiments with the result that on October 23, in the presence of officials of the Aëro Club of Paris, he was able to make the first public flight of a manned flying-machine heavier than air. On this occasion the aëroplane made a successful flight of some 200 feet at a height of about 10 feet above the level of the ground. In subsequent tests this distance was exceeded on November 12, achieving a flight of 215 metres (655 feet).

There has been founded in Paris a prize of $10,000, by MM. Henry Deutsch and Ernest Archdeacon to be awarded to the first aërial appliance without a balloon that will accomplish the distance of a kilometre (.621 mile), and as the aëroplane is now figuring in many experiments, it seems that this prize may be won as easily as that for dirigible balloons gained by Santos-Dumont. There was also included in this prize a $600 cup for the first aëroplane to accomplish a distance of 25 metres (82 feet) in free flight, and also an award for the first machine to make a flight of 100 metres (328 feet). The first of these honors was awarded to Santos-Dumont for his performance of October 23. The great interest thus stimulated in the aëroplane found expression in other offers of prizes and an increased amount of experimentation which marks the beginning of a new era in aërial navigation.

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Mittheilungen (Strassburg); *Wiener Luftschiffer Zeitung* (Vienna); *The Aëronautical Journal* (London); *L'Aëronaute* (Paris); *L'Aërophile* (Paris); *Revue de l'Aëronautique* (Paris); *Bolletino Della Societa Aëronautica Italiana* (Rome).

A'ËROPLANE. See Aëronautics.

A'ËROSTAT'IC PRESS. A machine used for extracting the coloring matter from dyewoods and other materials. A vessel is divided by a horizontal partition pierced with small holes. Upon this the substance containing the color is laid, and a cover, also perforated, is placed upon it. The extracting liquid is then poured on the top, and the air being drawn from the under part of the vessel by an air pump, the liquid is forced through the substance by the pressure of the atmosphere. This instrument was used in place of the modern hydraulic press.

A'ËROSTAT'ICS (Gk. ἀήρ, *aër*, air + στατός, *statos*, standing). That branch of science which treats of the weight, pressure, and equilibrium of air and other gases, and of the equilibrium of solids immersed in them. It is, therefore, a branch of pneumatics.

A'ËROT'ROPISM (Gk. ἀήρ, *aër*, air + τροπή, *tropē*, a turn, turning). The sensitiveness of certain plant organs, which enables them to orient themselves with reference to the movements of gases—usually oxygen—dissolved in the medium in which they are grown. Aërotropism is a special case of chemotropism (q.v.). The pollen tubes of many plants are negatively aërotropic: when grown in sugar solution they grow away from the surface of the medium which is in contact with air, and from which oxygen molecules are diffusing. Roots of maize are positively aërotropic in water. They curve so as to remain near the surface, often growing horizontally for long distances, in spite of the stimulus of gravity which tends to cause them to grow downward. (See Geotropism in Plants.) If thrust deeply into water they will often bend upward and seek the surface where oxygen is entering.

ÆSCHINES, ĕs'kĭ-nēz (Gk. Αἰσχίνης, *Aischinēs*) (389-314 B.C.). An Athenian orator, second only to his great rival, Demosthenes. He was born at Athens in humble station, served as a soldier, then became a clerk to some of the lower magistrates, and for a time was an actor in smaller parts. Finally, he became secretary to two distinguished statesmen, Aristophon and Eubulus, through whose influence he twice obtained election to a government secretary's office. Then, through his eloquence, grace, and legal knowledge, he rapidly became one of the leading men in the State. Sent as a member of the embassy to Philip of Macedon in 347 B.C., he was won over to favor the Peace of Philocrates (346), and then became the leader of the peace party at Athens as against Demosthenes, who headed the party which believed that Philip was to be opposed at every point and at any cost. In 345 he was charged with treason by Demosthenes and Timarchus, but, with the aid of powerful friends, defended himself successfully. Again, in 342, Demosthenes revived the charges in his famous speech *On the False Embassy*. Again Æschines answered successfully in a speech having the same title. He continued to favor Philip actively, and no doubt contributed to the spread of Macedonian supremacy. His fall was due, however, to his hatred of Demosthenes, whom Ctesiphon had proposed to reward with the public gift of a golden crown in recognition of his services to the State. Æschines thereupon charged Ctesiphon with making an illegal proposal, and in 330 attacked him in his brilliant oration, *Against Ctesiphon*, really directed against Demosthenes. He was completely defeated by Demosthenes' speech, *On the Crown*, and so failed in his suit against Ctesiphon, suffered *atimia*, and was condemned to pay 1000 drachmas fine. He went into exile at Rhodes, where, tradition says, he opened a school of oratory. He died at Samos. Æschines's posthumous fame is due to his three extant speeches, *Against Timarchus*, *On the False Embassy*, and *Against Ctesiphon*, which, according to Photius, were called in antiquity, "The Three Graces." An anecdote often repeated shows the esteem in which the third was held. On one occasion he read to his audience in Rhodes his oration against Ctesiphon, and some of his auditors expressing their astonishment that he should have been defeated in spite of such a powerful display, he replied: "You would cease to be astonished if you had heard Demosthenes." The speeches are edited by Schultz (1865); Weidner (1872); and in all collections of the *Attic Orators*. Consult especially, Jebb, *Attic Orators* (London, 1876-80), and Blass, *Attische Beredsamkeit* (Leipzig, 1887-98). The twelve letters which bear his name are spurious.

ÆS'CHYLUS (Gk. Αἰσχυλος, *Aischylos*) (525-?456-5 B.C.). The first of the three great Athenian tragic poets. He was born in Eleusis, and was of noble descent, being the son of Euphorion. He fought against the Persians at Marathon (490), Salamis (480), and Platæa (479); his epitaph celebrated his bravery on the field. He early turned to tragic composition, and, according to tradition, appeared first in 497 as a rival of the older tragedians, Pratinas and Chœrilus. His first victory, however, was not won until 485. We hear also that he wrote in unsuccessful competition with Simonides an elegy over those who fell at Marathon. He undertook, apparently, three journeys to Syracuse; one about 476-475, when he composed a play, *The Ætneans*, for King Hiero, in honor of the new city, Ætna, founded on the site of ancient Catana. He was back in Athens apparently in 472, but seems to have been again in Sicily between 471 and 469, when he had his play, *The Persians*, repeated there at Hiero's request. Soon after 458 he left his native city for Sicily for the last time, and died at Gela in 456-5. The story that he was killed by the fall of a tortoise from the talons of an eagle, which had mistaken the poet's bald head for a rock on which it could crack the shell of its prey, is probably only a popular tale applied to Æschylus, although it may owe its origin to a misinterpretation of a scene on his monument. The citizens of Gela erected a splendid tomb to him; by a decree of the Athenians a chorus was granted for his plays alone after his death, and in the fourth century, at the proposal of the orator Lycurgus, a bronze statue of him, as of Sophocles and Euripides, was erected in the theatre.

The productiveness of Æschylus lasted for more than forty years, during which he is said to have written ninety plays, of which twenty were satyr dramas. These tragedies were produced in groups of three, "trilogies," bound by a connecting thread of motive or interest, and each trilogy was followed by a satiric drama, of which genre Euripides' *Cyclops* is the only extant representative. We know seventy-nine titles in all, among them thirteen satiric plays. Only seven tragedies are extant, *The Suppliants*, *The Persians*, *The Seven Against Thebes*, *Prometheus Bound*, and the trilogy, *Agamemnon*, *Choëphori* and *Eumenides*. Æschylus won thirteen victories during his lifetime; that is, he was successful with over half the trilogies he presented.

The Suppliants is, in form, the earliest of the extant tragedies; the date of its presentation is unknown. The chorus is still the principal feature, the choral parts standing to the dialogue in the approximate relation of 1 : 2. The name is taken from the chorus, which is composed of the fifty daughters of Danaüs, who have fled from Egypt to Argos in their attempt to escape their suitors, the sons of their uncle Ægyptus, and there beg for protection from the Argive king. The odes set forth the violence of the sons of Ægyptus, the unholy character of the union which they wish, and the maidens' fears. The actors only interrupt these odes and carry the action forward but slightly in our modern sense. Yet the play has dignity, adequately expresses noble sentiments, and contains choral songs of great beauty. It was apparently the first play of the trilogy; the other tragedies were *The Egyptians*, which had for its theme the marriage of the sons of Ægyptus, and *The Danaids*, in which the murder of the bridegrooms was accomplished, and Hypermnestra was brought to judgment for disobeying her father in sparing her husband.

The Persians was presented in 472, and is also very simple in its structure. It has great interest for us, since it is the earliest extant attempt of the Greeks so to treat contemporary history. The subject is the battle of Salamis, in which Æschylus took part. The scene is laid, however, at the Persian court, where the dowager queen, Atossa, is awaiting the return of Xerxes. The chorus consists of Persian elders, who give their name to the play. The story of the Persians' defeat is dramatically told by a messenger; then, at the advice of the chorus, Atossa summons the shade of Darius, in the hope that his wisdom can save the State; but he can only prophesy the defeat at Platæa. The appearance of the defeated Xerxes, and an ode of sorrow for him and his subjects, close the play. This was the second of the trilogy; the first was *Phineus*, the third *Glaucus*, but the plots of both are unknown to us. The trilogy won the first prize.

The Seven Against Thebes handled a favorite subject drawn from the cycle of Theban myths. It was the third of the trilogy, the first two being *Laïus* and *Œdipus;* the satiric play was *The Sphinx*. This trilogy was presented in 467, and also won the first prize. The extant play represents the conflict between Eteocles and Polynices for the throne. Œdipus, ill-treated by his sons after he had blinded himself, prayed that they might divide the kingdom with the sword. To defeat the purpose of that prayer, the brothers agreed to reign alternate years; but Eteocles, the elder, once upon the throne, refused to surrender control at the expiration of the first year. Polynices, having raised a large army at Argos, where he had married the daughter of king Adrastus, came to besiege Thebes, he and six other chieftains arraying themselves each before one of the seven gates. A messenger relates to Eteocles the preparations of the seven and their oath to die rather than leave Thebes, and then describes the appearance of each chief; when Polynices is reached, Eteocles can no longer control himself, and rushes forth to slay his brother and be slain himself.

The *Prometheus Bound*, produced about 470 B.C., was the first of a trilogy, of which the *Prometheus Loosed*, and probably *Prometheus the Fire-Carrier*, were the other plays. In punishment for his rebellion in stealing fire from heaven for mortals' use, Prometheus is chained to a crag on the confines of the world, where a vulture sent by Zeus is to feed continually on his liver. He declines the proffered assistance of Oceanus, boasts of his services to men, condoles with Io, who comes to him in her mad wanderings, and prophesies her future, and, finally, when visited by Hermes, the messenger of Zeus, bids defiance to him, and amid whirlwind and earthquake disappears from view. In the following play Hercules shot the vulture and released Prometheus, and in the third probably the story of Prometheus was brought into relation with a local Attic cult of the hero.

The remaining three plays, *Agamemnon*, *Choëphori* and *Eumenides* formed the *Oresteia* trilogy. In the first play Agamemnon returns from Troy to his home, where his unfaithful wife, Clytemnestra, is living with her paramour, Ægisthus, by whom Agamemnon is treacherously murdered. This tragedy is not only the greatest of Æschylus' extant works, but rivals even Sophocles' *King Œdipus* for the first place among all Greek tragedies in the minds of critics. The *Choëphori* (*The Libation Pourers*) is named from the chorus of women who offer libations at Agamemnon's tomb. In this play Agamemnon's son Orestes returns to Argos to avenge his father's murder, and under a disguise obtains entrance to the palace, where he slays his mother and Ægisthus. This impious act of matricide was punished by the Furies. In the *Eumenides*, Orestes is pursued by these avenging powers until he is cleansed from his blood guilt and set free through the aid of Athene by the ancient court of the Areopagus. This trilogy represents the maturest work of Æschylus, and we may well doubt whether a greater was ever written.

The best critical edition of the text is by Wecklein (1885); edition with English notes by Paley (fourth edition, 1879), and many annotated editions of single plays; among these may be named Verrall's *Septem* (1887); *Agamemnon* (1889); *Choëphori* (1893). For complete translations consult: Potter, Blackie, and Plumptre; for separate plays, Browning, *Agamemnon* (London, 1887): Fitzgerald, *Agamemnon* (London, 1876); E. B. Browning, *Prometheus*, fourth edition (London, 1856); and Warr, *Oresteia* (1900).

ÆS′CULA′PIUS (Lat. form of the Gk. ’Ασκληπιός, *Asklēpios*). Among Greeks and Romans, a god of healing. No fully satisfactory derivation of the name has been presented. Æsculapius' worship seems to have originated in the valley of the Peneus in Thessaly, and to have had an important centre at Tricca. From this region it was probably carried by the inhabitants, as they were forced southward by invading tribes, and thus appears in Phocis, Bœotia, and Peloponnesus, where were celebrated sanctuaries at Titane, Thelpusa, and above all at Epidaurus, whence the worship was introduced into Athens in 420

B.C. Colonists carried the cult of Æsculapius far and wide; at Cos, Cnidos, and Pergamon were famous temples. In consequence of a plague, the god was brought to Rome in 293 B.C., and his temple established on the island in the Tiber. Æsculapius had temples in nearly two hundred places. His sanctuaries were sought by the sick, and his priests undertook the cure of disease. The patient, after certain religious ceremonies, slept in a hall near the temple, and during the night the god was believed to manifest himself in a vision, which, when interpreted by the priests, furnished directions for the treatment. After the cure the patient left an account of his case and an offering for the god. It seems likely that the priests had acquired considerable skill in treating the sick, and that the sacred sleep was merely a device to preserve the credit of the god. See EPIDAURUS.

It should be said that in the *Iliad*, Æsculapius is not spoken of as a god, and his sons Machaon and Podalirius differ from the other heroes only in their superior skill in treating wounds. It seems evident, however, that he was originally a divinity who later became subordinate to the great Apollo cult. Much points to Æsculapius as a chthonic god, though many regard him as connected with the light. Whatever his nature, Æsculapius early became fixed as a god of healing, perhaps losing his other functions through association with Apollo. His sons Machaon and Podalirius play a considerable rôle in heroic legend, and were claimed as ancestors by the Asclepiadæ (q.v.). His daughters, Hygeia (health), Panacea (all-healing), Iaso, Aigle, and others, bear names that show them to be merely personifications of abstract ideas connected with healing.

The myths connected with the life of Æsculapius varied in different localities; but the one which has become canonical appeared in a lost Hesiodic poem (the *Eoeæ*), and is known to us from a poem by Pindar and some scattered allusions. Apollo loved Coronis, daughter of Phlegyas, but she proved faithless and wedded the Lapith, Ischys. The news was brought to Apollo by the raven, who was punished for his message by being changed from white to black. Apollo slew Ischys; Artemis, Coronis; but while her body was on the funeral pile Apollo rescued his yet unborn son and took him to the centaur Chiron, who trained him in the healing art, in which he became so expert that he even raised the dead. For this presumption Zeus slew him with his thunderbolt. In art, Æsculapius is usually represented as a bearded man, wearing a mantle which leaves the right shoulder and breast bare. A beautiful head from Melos in the British Museum is probably an Æsculapius of the Praxitelean school. Consult: Walton, *The Cult of Asklepios* (New York, 1894); and Wilamowitz-Möllendorf, *Isyllos von Epidauros* (Berlin, 1886).

ÆS′CULUS. See HORSE CHESTNUT.

ÆSIR, ä′sĭr *or* ē′sĭr (pl. of *As*, Icel. *áss*, god, demi-god). The gods of the Northmen of Scandinavia and Iceland. There were eleven chief gods or Æsir besides Odin (the "all-father"), viz.: Thor, Balder, Ty or Tyr, Bragi, Heimdal, Höd, Vidar, Vali, Üll, Forseti, and Loki or Lopt. To these may be added Njörd and his son Frey, who were not originally Æsir. The naming of the gods differs in different parts of the *Younger Edda* (q.v.). The chief goddesses of Asgard, the Scandinavian Olympus, were: Frigga, Freyja, Nanna, Sif, Saga, Hel, Gefjon, Eir, Hlin, Lofn, Vör, and Snotra. These names, considered in the primary old Norse signification of the words, in most instances allude to some characteristics; yet it is impossible to determine whether they personify merely certain physical powers of nature, or were originally the names of individuals in the prehistoric period. Probably they have a mixed origin, and combine real names with physical powers. The principal source of information concerning these gods is the *Eddas* (q.v.), collections of the oldest songs and traditions of the people of Scandinavia.

Thor, son of Odin and Frigga ("the vivifying"), is the strongest of the Æsir. He seems to have been a god of that Phœnician form of nature worship which was superseded in Scandinavia and northern Germany by the faith of Odin. From Thor's hammer flashed lightning, and his chariot wheels made thunder as he went through the air, cleaving mountains, loosening frozen streams and pent-up rivers, and slaying giants and monsters. He was seldom in Asgard with the other Æsir, but dwelt in his mansion Bilskirner, in the densest gloom of the clouds. With his hammer he consecrated the newly wedded, and the sign of the hammer was made by Northmen when they took an oath or any serious obligation. The early Christian missionaries in Scandinavia, finding the faith in Thor too strong to be suddenly uprooted, tried to transfer many of his characteristics to their zealous convert, St. Olaf, who was said to have resembled the old Norse god in his comeliness of person, his bright red beard, hot, angry temper, and personal strength; while some of the monks of a later period tried to persuade the Northmen that in Thor their forefathers had worshipped Christ, and that his mallet was a rude image of the cross. Slaves and thralls killed in battle were believed to be under the protection of Thor, who, as the god of the Finns before the spread of the As religion, was honored as their special guardian against the tyranny of their old masters.

In Balder the Norsemen honored the beautiful, the eloquent, the wise, and the good, and he was the spirit of activity, joy, and light. His name signifies the "strong in mind." His wife Nanna reflected these attributes in a less degree. On his life depended the activity and happiness of all the Æsir except Loki, the "earthly fire" or incarnation of evil; and hence Loki, from envy of the beauty and innocence of Balder, accomplished his death, and afterward hindered his release from the power of Hel, the goddess of death. As the death of Balder was to be followed by the fall of all the Æsir, the gods had caused all things to swear not to injure him. But the insignificant mistletoe was overlooked or thought unimportant. Loki secured an arrow of mistletoe, and when the gods were amusing themselves by shooting at the invulnerable Balder, Loki gave this arrow to Höd, the blind god, and directed his aim so as to hit Balder, who was killed. The death of this beneficent god signifies the fading of summer before the blind and fierce winter, her preordained destroyer. The myth continues: After Balder's death, the gods captured Loki and shut him up in a mountain, where he will remain until the earth and all therein and the gods themselves shall be destroyed by fire (the powers of evil), the companion and liberator of Loki. Odin alone will survive, and then a new and purer world will arise in which Balder will again appear, and Loki, or evil, be no more heard of.

At first Loki, under the name of "Lodhur," or "flame," and as the foster brother of Odin, had united with the all-father in imparting blessings to the universe. Afterward he left the council of the gods and wandered into space, desolating and consuming with flame all things that came in his way. In the under-earth, where volcanic fires attest his presence, he consorted with evil giantesses and became the father of Hel, "pallid death," of Angerboda, "announcer of sorrow," the wolf Fenrir, and the Midgard serpent, who ever threatens the destruction of the world. Loki assumes any shape at will. As sensuality he courses through the veins of men, and as heat and fire pervades nature and causes destruction. After the establishment of Christianity, the attributes of Loki were transferred to Satan; but in Iceland an *ignis fatuus* is still known as "Loki's burning."

Njörd and his children, Frey or Fricco and Freyja, appear to have been honored in the North before the time of Odin. Njörd is said to have lived in Vanaheim, and to have ruled over the Vanir, or elves of light, long before he became one of the Æsir. He is the god of oceans and controller of winds and waves, and to him seafarers and fishermen raise altars and make prayers. Frey, his son, is the god of rain and fruitfulness, and his worship was accompanied with phallic rites. His sister Freyja, who holds a high rank among the Æsir, is the goddess of love, but her influence, unlike her brother's, is not always beneficent, and varies with the form she assumes in operating on the minds of men. Her chariot is drawn by cats, who are emblems of fondness and passion; and a hog, implying fructification or sensual enjoyment, attends upon Frey and herself. The Swedes paid especial honor to Frey, while the Norwegians worshipped Thor.

Ty (Tyr), the Mars of the Norsemen, is wise and brave, giving victory, fomenting strife. His name lives in our Tuesday (Ty's day), as does the name of Odin in Wednesday (Woden's day), Thor in Thursday (Thor's day), and Freyja in Friday (Freyja's day). Tyr's name signifies "honor," and his worship was widely spread in the north. Bragi was the god of eloquence and wise sayings, the originator of the Skaldic poems; and when men drank Bragi's cup they vowed to perform some great deed worthy of a skald's song. Bragi's wife was Idun, who guarded the casket of apples that gave to those who ate them perpetual youth. She was abducted by the giant Thiassi, and by Loki's craft removed to the other world. Her release in spring seems analogous to the myth of Proserpine. Heimdal, personified by the rainbow, is the god of watchfulness, the doorkeeper of the Æsir. Vidar, the strongest of the gods except Thor, is the personification of silence and caution. Vali is the brother of Balder and a great marksman. Ull decides issues in single combat; Forseti settles all quarrels; lovers find protection in the goddesses Lofn and Vör, of whom the former unites the faithful and the latter punishes the faithless; Gefjon keeps a watch over maidens, and knows the decrees of fate; Hlin guards those whom Frigga, the queen and mother of heaven, desires to free from peril. The queen herself, as Odin's wife and mother of the Æsir, knows but does not reveal the destinies of men. Saga is the goddess of narration and history; her home is in Sökvabek, the abyss, an allusion to the abundant streams of narrative, from which streams Odin and Saga daily drink and pledge each other. Snotra is the goddess of sagacity and elegance, from whom men and women seek good sense and refined manners. The Norns and the Valkyrias are closely connected with the gods. The principal Norns are Urd, past time; Verdandi, present time, and Skuld, future time. They twist and spin the threads of destiny, and make known what has been decreed from the beginning of time. The Valkyries, of whom there are over a dozen, are sent by Odin to the battle-fields to choose the slain.

It remains to add that in the gods here mentioned the Northmen recognized the makers and rulers of the world that now is, from whom emanated the thought and the life that pervade and animate nature. With Odin and the Æsir, the intellectual life of the northern people began; and although they ascribed to them human forms and acts, these were seldom without something higher and nobler than pertains to mortals; and while they recognized the existence of a state of chaos and darkness before the world began, they anticipated the advent of another state, in which the gods, like men, would receive their reward at the hands of a supreme All-father. See the article on SCANDINAVIAN AND TEUTONIC MYTHOLOGY, and the separate articles on the gods, such as FREY; LOKI; ODIN, etc.

Æ'SOP (Gk. **Αἴσωπος**, ***Aisōpos***). The name of a famous Greek writer of fables, who is said to have been born a slave in Samos late in the seventh century B.C., but to have gained his freedom by his cleverness. We may, however, well doubt whether he ever existed; we have the most varied accounts of him, many of which on their face are pure inventions; and the fables which passed under his name were certainly not written until long after the period in which he is supposed to have lived. Socrates in prison turned some of the current Æsopic fables into elegiac verse; and about 320 B.C., Demetrius of Phalerum made a prose collection of the fables known to his day. Whatever the facts as to Æsop's existence, it is certain that his soon became a generic name attached to those beast-fables which are part of the common property of the Indo-European peoples. The collection which now bears his name is for the most part prose paraphrases made by Babrius (q.v.), edited by Halm (second edition, 1860). Consult: Jacobs, *Introduction to the Fables of Æsop* (New York, 1896); and see PHÆDRUS.

ÆSOP (Lat. *Æsopus*), CLODIUS. A great Roman tragedian, contemporary with Roscius. Cicero put himself under the direction of these two to perfect his own acting, and Æsop did many friendly services to Cicero during the latter's banishment. Æsop was noted for sinking his own personality in the character he represented. He made his last appearance in 55 B.C. at the dedication of Pompey's theatre, after which his voice failed him. He left a fortune to a worthless son—the Æsop who, according to a well-known story, dissolved in vinegar a pearl valued at $40,000, to have the satisfaction of swallowing the most expensive drink ever known.

ÆSTHE′SIOM′ETER. See PSYCHOLOGICAL APPARATUS.

ÆSTHET′ICS (Gk. *τὰ αἰσϑητικά*, *ta aisthētika*, or *ἡ αἰσϑητική*, *hē aisthētikē*, the science of the beautiful, from *αἰσϑητικος*, *aisthētikos*, perceptive, sensitive, *αἰσϑάνεσϑαι*, *aisthanesthai*, to perceive, apprehend by the senses). The name now generally given to the science of the beautiful, the sublime, and the ludicrous. The history of this science furnishes us with a striking illustration of the truth that theory always follows practice. It was not till the noblest period of art in Greece had passed its zenith that any serious attempt was made to ascertain the nature of the beauty which art presents. The Sophists and Democritus seem to have made some essays in this direction, but we know practically nothing of the results they reached. It is only when we come to Socrates that we are on secure historical ground; and even in his case we know only enough to make it possible to begin our sketch of the history of æsthetics with his name. He seems to have taught that beauty is one with utility; a doctrine which is thoroughly in keeping with his ethical utilitarianism, but which gives no distinctive recognition to the beautiful as in any way differentiated from the good. Plato, in one respect, follows in his master's steps. While we cannot say that he identified the æsthetic and the ethical, yet in his most serious discussions he so completely subordinated the former to the latter as to make it a mere handmaid of morality. This attitude is unintelligible to any one who does not remember that Plato lived in an age of decadence in art and in art appreciation. The great poets in the Hellenic world were not in his time appreciated so much for their beauty as revered for their infallibility as guides in faith and practice. A quotation from Homer would definitely settle a question in policy or morals, and a "Thus saith Simonides" was a *ne plus ultra* of debate. This dogmatism in the interpretation of poetry was responsible for the degradation of the poets from their places as artists charming and inspiring mankind, to the position of pedantic pedagogues, whose deliverances were open to question on the ground of fact by any one who had the temerity to deny their popularly conceded inerrancy. Such a one was Plato, who proceeded to meet this dogmatization of poetry by a demand for its moralization. Homer, he claimed, must be expurgated in the interests of a more worthy view of God and man. Other arts suffered a like fate. For instance, only such music as could directly fit a man the better for a life of courage and temperance was to be tolerated in the ideal Platonic State. But this insistence upon the right to judge art by moral standards alone, though very prominent on the surface of Plato's thought, does not represent his best philosophy of the beautiful. Remembering that music was for Plato a general term for all the human interests over which the Muses presided, and that training in music was for him a cultivation of a proper habitual attitude toward the good, and that a scientific education in moral values was to follow the musical education and so bring habitual attitude to insight, one might almost say that with Plato the beautiful is the form in which the good appears to a properly trained but unreflective consciousness, a view quite like that of Hegel, twenty-two hundred years later. And as the good is the supreme principle of unity in the universe, beauty is itself a relatively simple unity in variety. This variety, however, must not be too complicated. It must have a very narrow range, or it would break over the bounds of unity. Hence only those works of art which are severe in their classical simplicity were considered as true embodiments of the principle or "idea" of beauty. Such an embodiment was technically called an "imitation." This term, without doubt, meant more for Plato than it would naturally mean for us. Imitation was symbolization as well as copy. But, for the most part, Plato was unable to free himself from the conception that second-hand reproduction was characteristic of all art. Hence art is further from reality than nature, which is the first embodiment of reality. But no definite statement of Plato's æsthetic views would do justice to the unsystematic many-sidedness of his thought on the subject. His dialogues contain many stimulating suggestions as to the nature of beauty, but no explicit æsthetic theory, built on the basis of these suggestions, could be fairly attributed to Plato.

Aristotle, being himself less artistic than Plato, was in a better position to make a more scientific study of æsthetics. His works on rhetoric and poetics, and, in a more desultory way, many of his other writings, were the first inductive studies we know of the principles of art. He differentiates the good from the beautiful: the good is dynamic (*ἐν πράξει*, *en praxei*), the beautiful may be static (*ἐν ἀκινήτοις*, *en akinētois*). The good, being thus always connected with action, appeals to consciousness in the form of desire for possession. We are interestedly concerned in the good; our concern in the beautiful is disinterested. For Aristotle, as for Plato, a beautiful object is a unity in variety, but Aristotle gives a wider scope to the variety than his predecessor. Under the proviso that a thing be not too large for easy apprehension, a considerable multiplicity in its organization was regarded as conducive to beauty, and, other things being equal, the greater the size the greater the beauty. Among these other things were propriety in the arrangement of parts, symmetry, and clearness of outline. Aristotle followed Plato also in making art an imitation of inartificial beauty, but he refused to follow Plato when the latter depreciated art for this reason. While Plato put the fine arts far below the works of the artisan, Aristotle put poetry, in one passage, above theoretic philosophy. This position, however, does not accord with the rank given in his *Ethics* to the life of philosophic contemplation. The value Aristotle attributed to art, especially to the drama, was due to the fact that it "effects, by means of pity and fear, the purgation (*κάϑαρσις*, *katharsis*) of such emotions." The meaning of this has been warmly debated. If purgation is taken in a moral sense, then Aristotle has relapsed into the Socratic position that art is not differentiated from morality. But a more plausible interpretation is that purgation is used in its physiological significance. This would make the meaning to be that drama gives free and healthy discharge to the passions of pity and fear, and thus prevents emotional congestion. Greek speculation on æsthetical theory comes to a close in Plotinus (q.v.), who explains beauty by referring it to the work of an objective reason, which informs dead matter so as to make it become an expression of itself. This creative reason is the transcendentally beautiful; matter transformed by it is the empirically beautiful. Artistic production is not, however, necessarily limited to the copying of the natural products of the supreme reason. The human reason, by virtue of its participation in the divine, may so transform objects that they shall become more beautiful than they are in their naturalness. Art is thus raised from the stage of imitation to that of idealization, although idealization is taken mystically.

No important æsthetic speculations come from mediæval writers. Mr. Bosanquet, in his *History of Æsthetic,* has satisfactorily explained this comparative barrenness of the Middle Ages in æsthetic theory. It was not due, as the traditional view of mediævalism would seem to imply, to the deadness of that period in things intellectual and spiritual, but to the enormous tension of the higher life, which busied itself so absorbingly in practical creative activity as to leave no leisure for reflection upon its own work. Mediævalism was engaged in the problem of building the foundations for a new life, and, therefore, for a new art. The art of classical antiquity was comparatively simple; the perfection of its form was made possible so early by its limited ambition. In general, it sought to do justice merely to the beauty of form. It was a successful criticism of life, only because it criticised one aspect of life, leaving the richness and variety of its contents to the one side. But Romanticism as a creative principle in art began to work early in the Middle Ages. The wilder, more turbulent spirit of the Teutonic barbarians would not brook confinement within the narrow lines drawn by classic masters, and for a whole millennium was wrestling with the practical problem of making art richer by the incorporation within it of all the phases of nature and of human life, which classic art, with true instinct for its own essential limitations, had ignored; and just as ancient æsthetic theory was not constructed until the returns from ancient practice were all in, so modern æsthetic theory could not be supplied with its data till modern art had become to a great extent a completed achievement, challenging reflection to concern itself with the discovery of the principles involved. Mr. Bosanquet is, perhaps, right in representing Shakespeare as being the last of the great artists in the long succession that began with the architect of St. Sophia; Shakespeare succeeded in the great common endeavor to render into art life and nature in all their infinite complexity, and yet to make the rendition as unitary in its effect as were the art products of the golden age of Æschylus and Pheidias. In him the wheel of artistic creation had come full circle, and after him, therefore, the wheel of æsthetic theory could begin to turn. But there was another reason why, after the time of Shakespeare, æsthetic theory should have become a great need. Not only did all the richness of mediæval and modern artistic achievement challenge the theorist to study it, but the art of classical times had come to life again in the great archæological discoveries of the eighteenth century. The literary renaissance of antiquity in the fifteenth century was now followed by the resurrection of the plastic arts of Greece and Rome. The striking contrast between the formal severity of the antique and the freedom of the modern demanded that an inquiry should be instituted which should succeed in correlating, and, by correlating, succeed in justifying the two strikingly different types. This demand that theory should do justice to the principles of beauty incorporated in art was reënforced from the side of philosophical speculation.

The seventeenth and eighteenth centuries were a time of tremendous philosophical energy; and as the idealism of modern philosophy became more and more concrete, it was inevitable that æsthetic questions should force themselves more and more upon the attention of philosophy. Thus, as we find Lessing and Winckelmann representing predominantly an interest in art for art's sake, so we find Baumgarten and Kant representing an interest in art for philosophy's sake. These two tendencies united in working out a modern æsthetic theory, which was finally to be based on solid scientific grounds with the aid of experimental psychology. The appreciation of the æsthetic significance of all these contributions cannot be attempted here. Suffice it to say that Lessing made an important addition to æsthetic theory by marking off the boundaries of poetry from the plastic arts. The medium of the former is time, and that of the latter is space. The former can represent action, and is, therefore, capable of expressiveness, whereas the plastic arts are limited to the treatment of formal beauty and of the beauty of colors. The ugly is out of place in the plastic arts, because, once represented in painting or statuary, it gets a permanence that becomes revolting. This thought might be illustrated by referring to a line of Keats's *Ode on a Grecian Urn,* "Forever wilt thou love and she be fair." There is a subtle but powerful delight ministered by this insistence upon the immortality of youth and love, caught and made perpetual by the ceramic art. But change the *motif;* let it be: "Forever wilt thou *loathe* and she be *foul,*" how quickly the thought of the abidingness of the unpleasant creates disgust with the pottery, however skillful may be the representation of this phase of life! Baumgarten's significance was more that of a pioneer and name-giver than that of an important contributor. Carrying out the Cartesian idea that sense is confused thought, he added to the Wolffian (see WOLFF) philosophical encyclopædia, which included ontology, cosmology, ethics, and psychology—all sciences of clear thought—a new discipline dealing with obscure thought; and he gave to the work in which he treats this new subject the title *Æsthetica.* This was the first time that the term was employed to designate the science which has since Baumgarten's day quite constantly been called by this name. But great as is the convenience of having a name to give to a science, an advance in the way of a satisfactory handling of this science could hardly be expected from a thinker who appreciated beauty only as an imperfect imaging of what is intellectual.

Kant (q.v.) has been an important factor in determining the speculations of modern philosophical æsthetics, although what he calls æsthetics in his famous *Critique of Pure Reason* is something entirely different from what to-day passes under that name. He strikes, in his *Critique of the Faculty of Judgment,* a distinctly modern note in emphasizing the affective side of æsthetic appreciations, thus exalting the artistic consciousness from the position of being an imperfectly developed logic and metaphysics. But Kant's views are too completely determined by the idiosyncrasies of his philosophy ever to have become generally acceptable. His philosophy is dominated by the thought of a great breach between noumena and phenomena. (See APPEARANCE.) The datum of philosophy is this apparent breach, but the problem is in large measure the healing of it. But this Kant could never succeed in effecting. In his first two *Critiques*—those of Pure Reason and of Practical Reason—he deals with phenomena and noumena in their antithesis and separation. In his *Critique of the Faculty of Judgment* (1790), he attempts to bring about a connection and synthesis. In his definition of beauty, he follows his division of categories into those of quality, quantity, relation, and modality. Qualitatively, the beautiful is the disinterestedly pleasing; quantitatively, it is the universally pleasing; relationally, it is that which has the form of purposiveness without the reality of purpose, and, modally, it is the necessarily pleasing. Thus, disinterested, universal, and necessary pleasure in simulated design is for Kant the essence of beauty. The sublime is that which pleases because of a reaction, after an inhibition of vitality,—a reaction which gives rise to a higher degree of vitality. The ridiculous is also a reaction against tension, being "the sudden change of a tense expectation into nothingness." As in the case of Kant, so in those of Schelling (q.v.) and Hegel (q.v.), the philosophy of the beautiful has its part assigned to it in accordance with a comprehensive view of the universe. Schelling's absolute was one of utter indifference of subject and object. Therefore, in artistic appreciation it is this ultimate unity of absolute indifference which is perceived as the beautiful. In Hegel the absolute is not the indifferent, but the differentiated unity of subject and object, and art is a form of the absolute consciousness, i.e., it is such an attitude of consciousness toward its objects as does not eject them into an existence independent of itself; yet it does not fail to observe the distinction between consciousness and objects. There are three forms of absolute consciousness, of which art is the first. In the art-consciousness the unity of subject and object is relatively simple. Although subject and object are not reflectively identified, they are not held apart, as in scientific knowledge. The beautiful is thus the absolute idea immediately perceived. Hegel's followers Rosenkranz, Schasler, and Vischer, worked along these lines and elaborated a very detailed æsthetics. Schiller (q.v.) returns to Kant and differentiates the material and the formal impulses, which, working in conjunction, produce the beautiful.

In England, Shaftesbury (q.v.) worked in a Platonic spirit, and Hutcheson (q.v.) makes "all beauty relative to some mind perceiving it." The mind has a faculty, "an internal sense," which is capable of receiving ideas of beauty from all objects in which there is uniformity in variety. Reid (q.v.), on the contrary, gives an objective value to beauty, claiming that it exists apart from our perception of it. Henry Home calls beauty the pleasure connected with sight and hearing. Hogarth (q.v.) makes a great advance in paying attention to details. He went back to the ultimate sensitiveness of the mind to certain geometrical forms and colors, and in this respect was the forerunner of recent psychological æsthetics; while Burke (q.v.) goes further and looks for the explanation of beauty in certain physiological effects produced by the beautiful object. The relaxation of nerves by appropriate stimuli has a soothing effect, which is the basis of æsthetic pleasure. Hence the beautiful must be *petite*. Alison (q.v.) is distinguished by the thorough-going way in which he applies Associationism to the explanation of pleasing æsthetic effects. The delight we take in a beautiful object is due to its delightful suggestions. Bain (q.v.) elaborates this Associationism and differentiates the æsthetic pleasures from others by their disinterestedness, purity, and sympathetic value, as being sharable in a way in which others are not. Spencer (q.v.) introduces Evolutionism into æsthetics, and thus accounts for the æsthetic pleasures that in the individual seem to arise from congenital dispositions, by claiming that these dispositions are the survivals by heredity of associations formed in the history of the race. Consult: Gayley and Scott, *Guide to the Literature of Æsthetics* (Berkeley, Cal., 1890); W. Knight, *Philosophy of the Beautiful* (New York, 1891); B. Bosanquet, *History of Æsthetic* (London, 1892); Walter, *Geschichte der Aesthetik im Altertum* (Leipzig, 1893); Hirn, *Origins of Art* (New York, 1900); Puffer, *Psychology of Beauty* (ib., 1905); Dessoir, *Aesthetik und allgemeine Kunstwissenschaft* (Stuttgart, 1906).

ÆSTHETICS, EXPERIMENTAL. Experiment made its way into the field of æsthetics from psychology on the one side and from philosophy and mathematics on the other. About the middle of the last century, while experiment was young in psychology, a dispute arose among theoretical writers concerning the æsthetic value of simple space-forms. A. Zeising, professor of philosophy in Munich, urged that formal beauty demands a simple proportionality; while others saw, in both nature and art, a preference for equality, balance, or the relations given by the vibration ratios of consonant musical intervals, or the heptagon, or the square. Zeising carried out his theory most methodically of all. He meant by proportionality the division of an object in such a way that the smaller part, the minor, stands to the greater, the major, as the greater to the whole. This division is called the Golden Section. Zeising made the most extravagant claims for the importance of his law. He maintained that it furnished the pattern for the human body, the structure of plants, the forms of crystals, the arrangement of planetary systems; and that it determined the proportions of buildings, sculptures, and paintings.

It occurred to G. T. Fechner (q.v.) to test the claims of Zeising and his opponents, in so far as æsthetical preference was concerned, by observing series of divided lines and of simple forms—rectangles, ellipses, and crosses—under experimental conditions. He made use of a large number of persons, asking each to state his preference within each series. Fechner also performed an important service in discriminating between the associational factors in the æsthetic judgment (those furnished by the use, purpose, rareness of objects), and the direct effect produced upon the feelings by the form or the color or the rhythm itself. It is to this latter non-associational element that experiment has directed its attention. It offers the advantages of simple and constant conditions and of a direct appeal to the undivided judgment. It has confined itself thus far to the elements which are common to all individuals. Within this limited field it may fairly be said to have been successful.

METHODS AND RESULTS. The result of Fechner's work was to modify the assertions of Zeising and other theorists. A decided preference for the proportion of the Golden Section was found with certain figures, particularly the rectangle. For the simple sectioning of a line, on the other hand, preference was shown for the division into halves and thirds. Fechner is justly called the founder of experimental æsthetics. He laid out the field, distinguished the direct and the associative factors, gave the methods, and applied them successfully. There are three chief methods now used in experimental æsthetics: (1) choice, (2) construction, and (3) use. In the method of choice, series of simple figures, tones, or colors are presented to the observer, who selects the one most pleasing in its own right. The objects may be given in pairs (method of paired comparisons), or in a progressive series (serial method), or promiscuously, according to the material used. In the method of construction the individual is given elements, e.g., two narrow strips of cardboard, and is asked to make from them the most pleasing figure (cross) that he can. The method of use or application consists in collecting the dimensions of simple, common objects, as visiting or playing cards, envelopes, vases, newspapers, books, windows, façades, in order to discover the usual or most common proportions. The value of the last-named method rests on the supposition that the proportions most used are the most agreeable. This is true only in part; fitness, cost, use to which an object is put, and custom play a large part; for these reasons the method requires caution. The second method suffers from rather narrow limitations. Both it and the third, however, are of value as checks upon the method of choice, which is the most trustworthy and has been most successfully employed.

The methods named have been used chiefly with spatial forms: rectangles, crosses, lines, angles, circles, ellipses, and triangles. They have succeeded best with the simpler figures. Fechner's early results have been, for the most part, confirmed. We know now that certain divisions and dimensions are æsthetically pleasing for their own sake; that is, with no specific association attaching to them. The most agreeable are expressed by the ratio 1:1 and (approximately) 3:5, the last-named ratio standing near the relation for the Golden Section given above. For example, the grand average from twenty-three series in which various forms (lines, angles, crosses, and ellipses) were used, with a number of observers, gave as the most pleasing ratio 1:1.635, with an extremely low fluctuation for the different series. We conclude, then, that the most satisfying combinations are those in which the parts are alike and those in which they are moderately similar. One is tempted to point to the mathematical relation of the golden section as an explanation of the æsthetic enjoyment found in proportion. But the relation is in itself no explanation, and, even if it were, the deviations from it which many individuals show would invalidate it. A recent explanation of the æsthetic feelings connected with space-forms points out that man involuntarily invests spatial objects with the activities—strains, resistings, tensions—which he himself feels in his own body. According as an object—a pillar, a statue, or a block of stone—gives evidence that it is capable or incapable of holding its own, supporting its load, and maintaining its own integrity does it awaken a feeling of satisfaction or dissatisfaction in the observer. This tendency shows itself, it is argued, even where the object is reduced to a mere outline. The argument gains part of its weight from the fact that it also gives a reason for a host of illusions connected with our perception of spatial relations. A true mathematical square is not seen as a square at all, but as a rectangle whose height is greater than its breadth; a bisected vertical line looks longer above the point of division than below, and so on. The allowance made for these illusions is probably the most important advance in method since the days of Fechner. It is to be noted that the explanation, which we may call a dynamic one, brings in the associational factor. Yet this is not a fatal objection, for the associations assumed are generic, so to speak, and thus constant, within limits, for all individuals. The theory must, however, share honors with a psychophysical one, which accounts for the elementary æsthetic feelings in terms of the simplicity and complexity of psychophysical processes underlying them. It is probable, that is, that the facility with which certain proportions are cognized affects directly the excitability of the nervous system in such a way as to produce pleasure.

The method of choice may be adapted to the determination of the æsthetic value of elementary musical combinations. We obtain thus a graded series of pleasantnesses for tonal intervals both when the constituent tones are given simultaneously (see FUSION), and when they are given successively. There is afforded in this way an opportunity to compare directly the result of experimentation and the elements of musical composition established by generations of practice. It must be added that simple musical combinations offer a particularly good field for experimental exploration of the æsthetic feelings, because the direct, sensuous factor plays a much more important rôle here than in spatial form, and the associative factor is correspondingly less prominent. This is especially true of rhythm.

Finally, æsthetic preference in the realm of color, saturation, and brightness has been determined by the method of paired comparisons—the observer comparing in turn a red, then a green, then a blue, etc., with each of the other members in a series of colors, and also by passing judgment on those visual sensations taken singly. The chief results are these: (1) the most saturated colors are usually preferred; (2) given likeness of saturation, individual preferences vary from color-tone to color-tone, and (3) with colors which are equally pleasing, the combination of any two gives greater satisfaction the more unlike (contrasting) the colors.

Consult: G. T. Fechner, *Zur experimentalen Aesthetik* (Leipzig, 1871); *Vorschule der Aesthetik* (Leipzig, 1876); T. Lipps, *Raumästhetik und geometrisch-optische Täuschungen* (Leipzig, 1897); George Santayana, *The Sense of Beauty; Outlines of Æsthetic Theory* (New York, 1896).

ÆSTIVAL, ĕs′tĭ-val *or* ĕs-tī′val, or **ESTIVAL** (Lat. *æstivus*, of summer, from *æstas*, summer). Plants whose conspicuous functions, especially the blooming of the flower, occur in summer, are said to be æstival. Prairie plants, especially of the composite family, are largely æstival, and contrast strongly with the vernal plants of the woods, such as many members of the lily family.

ÆS′TIVA′TION. See Flower; Hibernation; and Estivation.

AËTA, ä-ā′tȧ. The woolly-haired, dark colored, dwarfish aboriginal folk of Luzon and other Philippine islands; also called Negrito. They live in out-of-the-way places in lower savagery, and are supposed to number 20,000. Ate, Eta, Ita, Mamanua, etc., are synonyms. Consult: A. B. Meyer, *The Negritos* (Dresden, 1899). See Philippines.

ÆTHEL, ăth′ĕl. A combining form which occurs as the first element in many Anglo-Saxon names. It is derived from A. S. *æfel*, noble, and is akin to Ger. *Adel*, nobility, *edel*, noble; compare Engl. *atheling* (q.v.), an Anglo-Saxon prince or nobleman, and *ethel*, noble. The names in which this combining form occurs (e.g., *Ethelbald*, "Noble Bold," *Ethelwulf*, "Noble Wolf," etc.), when given in the present work, are generally to be found under the more modern spelling *Ethel-*, which is that adopted in Leslie Stephen's *Dictionary of National Biography*.

ÆTHELBALD, ăth′ĕl-bąld. See Ethelbald.

ÆTHELHARD, ăth′ĕl-ärd. See Adelard.

ÆTHELING, ăth′ĕl-ĭng. See Atheling.

Æ′THIO′PIS (Gk. Αἰθιοπίς). The name of a Greek epic in five books by Arctinus of Miletus, one of the Cyclic Poets (q.v.). It relates the events of the Trojan War immediately succeeding those described in the *Iliad*, the heroine of the poem being the Amazon queen, Penthesilea.

Æ′THRIOSCOPE (Gk. *αἰθρία*, *aithria*, clear sky + *σκοπεῖν*, *skopein*, to observe, watch). An instrument to measure the temperature effects produced by radiation, invented by Sir John Leslie in 1817, and described in the *Transactions* of the Royal Society of Edinburgh for the following year. It consisted of a concave metallic mirror, or cup, containing a differential thermometer, and was so finely constructed as to be influenced by a passing cloud. With it Leslie hoped to discover the effect of the clouds upon atmospheric conditions, and to explain other meteorological phenomena.

AËTION, ȧ-ē′shĭ-on (Gk. 'Αετίων). A Greek painter who lived in the latter half of the fourth, or the first half of the third, century B.C., and is, perhaps, to be identified with the sculptor Eëtion. He was highly praised for his technique, and is classed with such painters as Nicomachus and Apelles. His most famous painting represented the wedding of Alexander and Roxana. Scarcely anything is known of his life.

AËTIUS, ȧ-ē′shĭ-ŭs. Called "the ungodly." A Roman theologian who lived in the fourth century. He was born in Antioch, and sold into slavery; when liberated, studied medicine and theology at Antioch, became a deacon, and developed the doctrines called the Aëtian heresy. Under the Emperor Constantius he was banished (360), but recalled in 361 by Julian, and was shortly after made bishop. He died in Constantinople, 367.

AËTIUS. A Roman general, born about 390 A.D. He long defended Gaul from the barbarians; with Theodoric he compelled Attila to raise the siege of Orleans; he followed the Huns to the plains of Châlons, and defeated them in a great battle, in which 300,000 men are said to have been slain. The Emperor Valentinian III. became jealous of Aëtius and slew him with his own hand, 454 A.D.

ÆT′NA. A Latin poem, in hexameters, describing Mount Ætna and one of its eruptions, with a theory as to their cause. The work used to be attributed to Vergil, but was probably written by Seneca's friend, Lucilius Junior, who was a procurator in Sicily. Consult: *Ætna*, edited by H. A. J. Munro (Cambridge, 1867).

ÆT′NA, Mount. See Etna, Mount.

ÆTO′LIA (Gk. *Αἰτωλία*, *Aitōlia*). A district of ancient Greece, lying on the north coast of the Gulf of Corinth. The ancient Ætolia was divided from Acarnania on the west by the river Achelöüs, and extended as far as the river Daphnos, where it was bounded by Locris and Doris; on the north it bordered on Thessaly and Epirus. In later times these boundaries were considerably extended to the north and east. The country has few cities, and is generally wild and barren, though the southwest portion (Old Ætolia) contains two marshy but fruitful plains, one on the coast, the other north of Mount Zygos, largely occupied by the lakes Apokuro (Trichonis) and Zygos (Hyria). This was the Ætolia of the Heroic Age, in which the Ætolians play a conspicuous part. It was in Calydon, that, according to the legend, Meleager (q.v.) slew the boar. When they next appear in Greek history, at the time of the Peloponnesian War, they are described by Thucydides as rude and barbarous. The Ætolian confederacy, first mentioned in 314 B.C., but of unknown origin, became important in the time of the Achæan League. (See Achæa.) The supreme authority was the general assembly of all Ætolians, which met yearly after the autumnal equinox at Thermon, and elected the general and other officials. During the third century B.C. the league steadily increased its power, in conflict with the Achæans and Macedon, and, finally, in pursuance of its characteristically selfish policy, entered into alliance with the Romans. As this did not yield all that was expected, it afterward joined Antiochus and Perseus in their wars against Rome. The political influence of Ætolia was destroyed in 189 B.C. by the Romans, though the league existed nominally even to the time of Sulla. With Acarnania, Ætolia now forms a province of the modern kingdom of Greece. The chief rivers of Ætolia are the Aspropotamo (Achelöüs), in the west, the Phidaris (Euenos), in the centre, and the Marnos (Daphnos), in the east. The people in the plains are employed in agriculture and fishing; while in the mountain districts some traces of the rude and martial character of ancient Ætolia may still be found. The chief towns are Mesolonghi, Lepanto, and Agrinion. Consult: W. J. Woodhouse, *Ætolia* (Oxford, 1897).

ÆTO′LIAN LEAGUE. A confederacy of the tribes of Ætolia, and afterward including also parts of Acarnania, Locris, Thessaly, etc. Its executive officers were chosen at a yearly meeting called Panætolicum. It was formed after the battle of Chæronea (338 B.C.) to resist the encroachments of Macedon, to which, after the death of Alexander, it proved a serious antagonist, as well as to its rival, the Achæan League. (See ACHÆA.) Later, for a time, it was in alliance with the Romans, but, having taken part with Antiochus III. against them, it lost its power upon his defeat, 189 B.C.

AFANASIEFF, ä′fȧ-nä′syĕf, ALEXANDER NIKOLAYEVICH (1826-71). A famous student of Russian folklore and national poetry. He published a collection of popular tales (4 volumes, 1863; third edition, 2 volumes, 1897), and *The Poetic Views of Nature Entertained by the Ancient Slavs* (3 volumes, Moscow, 1866-69), besides numerous contributions to various periodicals.

AFAR, ä′fär. See DANAKIL.

A′FER. See ARNOBIUS.

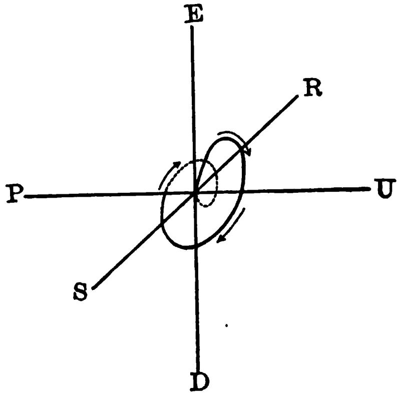
AFER, CN. DOMITIUS. A Roman orator, teacher of Quintilian. He was born in Gaul, 15 B.C. and died 59 A.D. He was made a consul by Caligula.

AFFEC′TION, AFFEC′TIVE PROC′ESSES (Lat. *affectio*, a state of mind produced by some influence, from *afficere*, to do something to one, *ad*, to + *facere*, to do). For many centuries psychologists have discussed the phenomena of the human mind under the three headings of Intellect, Feeling, and Will. (See PSYCHOLOGY.) One of the chief aims of modern psychology is to analyze the experiences thus designated into their simplest component processes, and so finally to reach the mental elements, the ultimate and irreducible constituents of mind. The various forms of intellectual experience (perception, idea, association of ideas, etc.) reduce, on such analysis, to the sensation (q.v.); the various forms of feeling (emotion, passion, mood) to the affection; while the simplest will-processes are found to contain both sensational and affective elements.

Affection, then, is the mental element which characterizes all varieties of our emotional life. It is the last result of the analysis of joy and sorrow, love and hate, anger and fear: it forms the common basis of the sense-pleasures of eating and drinking, and of the highest æsthetic appreciation of music and painting. Like sensation, it is the product of scientific abstraction; it is never experienced singly, but always in connection with other processes. And, like sensation, it cannot be reduced to anything simpler than itself. Many attempts have been made, in the interests of scientific economy, to derive it from sensation, which would then remain as the only mind-stuff, the sole material of which the mind is built; but so far all attempts appear to have failed.

As to the different kinds or "qualities" of affection, modern psychology is divided. Some psychologists maintain that the manifold forms of affective experience are traceable, in the last resort, to the two typical processes of pleasure and pain, or, in the better phraseology—since pain (q.v.) is a sensation, with a definite organ in muscle and skin—to pleasantness and unpleasantness. Relief, despair, hope, satisfaction, anxiety, resentment would then be, as pure feeling and at any given moment of their course, either simply pleasant or simply unpleasant. There are two principal objections to this view: (1) that it does not do justice to the immense complexity and variety of the emotions; and (2) that it confuses the lower with the higher, the pleasure of a good dinner with that of Beethoven's *Ninth Symphony*. The latter point is very differently taken by different psychologists. One says, e.g., that the unpleasurableness of a toothache, of an intellectual failure, and of a tragical experience is so patently diverse that assertions to the contrary require no criticism. Another declares as positively that there is no qualitative difference discoverable between the pleasantness of a color and that of a successfully concluded argument, when careful abstraction is made from the very wide differences in their attendant circumstances. And so the matter rests. The former objection, however, has suggested a more elaborate classification of the affective qualities.

According to this second view, the number of affective qualities is as large as—if not larger than—the number of sensations. We have, it is true, no names for the great majority of them; but that is because language has been developed, not for the sake of a scientific psychology, but for purposes of practical intercourse, and for all practical purposes the discrimination of the main emotional types (anger, fear, and the rest) has been sufficient. We can, however, distinguish three main trends or directions of the affective consciousness, within each of which a long series of ultimate qualities is ranged between opposed extremes. These directions are those of (1) pleasantness-unpleasantness: (2) excitement-depression (tranquilization, inhibition); and (3) tension-relaxation (resolution). The first series of qualities comprises the affections of the present time; our affective state, as determined by the occurrence of any given moment, is one of pleasure or displeasure. The second series contains all the shades and tints of our affective anticipation of the future; we are aroused or subdued by what is to come. And the third series represents the effects of experiences just past; we are kept on the stretch, or relieved from our tension, by what has just happened. Or—to put the differences from another point of view—we are pleased or displeased by



AFFECTIVE PROCESSES.

Wundt's Scheme of the Affective Processes. P, U, Pleasantness, Unpleasantness; E, D, Excitement, Depression; S, R, Strain, Relaxation. The curved line represents the course in consciousness of an actual feeling.

the *character* of our experience; we are excited or tranquilized, according as it is more or less *intensive;* and we are held on the strain of expectation, or relieved from this strain, according as it lasts a longer or a shorter *time.* Affections of all three types are, as a rule, combined in the concrete feeling, in "real" affective experience. Suppose, e.g., that one is looking forward to a pleasant event. One has, at first, a feeling of tension, to which are soon added, in succession, feelings of unpleasantness and of excitement. All three affections increase gradually in strength until the expected event occurs. At that moment the unpleasantness changes to pleasantness, and the strain to relaxation, while the excitement is still continued. Presently the excitement dies away. Then the feeling of relaxation or satisfaction fades out; and finally the effect of the event passes off altogether, with the fading of pleasure to its indifference-point.

It would seem, then, that expert opinion could hardly be more sharply divided. On the one hand, we have the belief in two and only two affective qualities, homogeneous throughout the affective life; on the other, the suggestion that there are many thousand feelings, each of which is unique in quality, though the whole number fall roughly into three great groups. It should, however, be said that these conflicting views are held tentatively, not dogmatically. It is generally agreed that we do not as yet possess the data for a scientific theory of affection. The appeal lies to experiment; and the application of experimental method in the sphere of feeling is extraordinarily difficult. Nevertheless, the problem stands to-day in the forefront of psychological inquiry, and much may be expected from the near future.

We have, as things are, two principal methods for the study of affection: the method of impression and the method of expression. The former we owe to Fechner (q.v.); the latter to the Italian physiologist A. Mosso. (1) The method of impression in its original form is also known as the serial method or the method of selection. (See Æsthetics, Experimental.) A long series of graded stimuli (colors, textile fabrics, ovals, or crosses) is laid before the observer, who notes his preference for particular terms in the series. From these preferences a curve may be constructed, showing the relative feeling-value of dull and brilliant colors, of rough and smooth surfaces, etc. In its later form, the method is known as that of paired comparisons. The stimuli are here presented to the observer two at a time, so that every term in the series is compared with every other term. The experimenter records the number of preferences that each term receives, and a curve is platted from the results. It is found, e.g., in work with colored impressions that saturated colors (red, blue) are as a rule preferred to unsaturated (pink, brown, sky blue, navy blue), but that there is a curious uncertainty as regards yellow—some observers ranking this color very high, while others as decidedly prefer orange (yellowish red) and yellow green. (2) The method of expression, on the other hand, seeks to reconstruct the affective consciousness from a study of its bodily symptoms or manifestations. It is a matter of common knowledge that men blush with shame and tremble with fear. The bodily indications of affection are, indeed, both widespread and easily observable, while at the same time they appear to reflect the most subtle and delicate phases of affective process. Their common cause is to be found in changes of muscular innervation; the whole muscular system, voluntary and involuntary, answers to those changes of nervous excitation which correspond, on the physical side, to changes in our state of feeling. Recourse has therefore been had to the various physiological instruments which register the systemic effects of such excitatory changes. Appeal has been made to the sphygmograph, which records the height and frequency of the pulse (change in the innervation of the heart); to the pneumograph, which records the depth and rate of respiration (change in the innervation of the respiratory muscles); to the plethysmograph, which records the volume of a limb or member, of arm or finger (change in innervation of the superficial blood-vessels, and therefore of the amount of blood contained in them); and to the dynamometer or dynamograph, which records the grip or pull exerted by the voluntary muscles. In spite of the attention which this method has received, psychologists are as yet far from unanimity as regards its value or its results: the simple correlations between the physical and the mental, made out for pleasantness and unpleasantness by the earlier workers, have not been confirmed by more recent researches. A correlation does, perhaps, obtain with some definiteness in the case of involuntary movement. If the hand is laid upon the plate of a planchette while our mood is one of indifference, the pencil will make a little ragged spot upon the paper, but will take no definite direction. Let a pleasant stimulus be given and the arm travels away from the body, as though the organism were reaching out after the pleasing object; the pencil traces a steady line outward. Let an unpleasant stimulus be given, and the arm comes in toward the trunk, as if the organism were shrinking from the displeasing object; the pencil traces a steady line inward.

There are, however, four reasons why this method of expression has not determined the number of affective qualities. In the first place, the method is still very young, and the technical difficulties involved in the giving of stimuli have not yet been fully overcome. Several of the instruments ordinarily used are too crude for the tasks imposed on them. Secondly, the method presupposes that the subject of the experiment is in a normal, indifferent state, and the regulation of this state is exceedingly difficult. Thirdly, knowledge of the physiological mechanism of the curve variations is at present incomplete: we have reason to believe that a particular feeling must always be connected with a particular change of innervation, although such a change may be wrought wholly within the physiological sphere. Fourthly, the expressive method gives us the expression, so to say, not only of affection but also of sensation; the organic reaction consequent upon the application of a sensory stimulus, as such, is both complicated and far-reaching. Hence, so long as introspection gives no decided verdict, the bodily symptoms may and will be differently interpreted. The correlation of physical and mental in pleasantness and unpleasantness has not yet been satisfactorily made out. An elaborate correlation has been suggested by those who hold the alternative theory, of a large number of ultimate affections. On this view, pleasantness is indicated by strong and slow, unpleasantness by weak and rapid, heartbeats. We must suspend judgment until further evidence is submitted.

A third method, which has recently been proposed, is (3) that of suggestive disintegration of the affective consciousness. If we assume that the concrete feeling is made up of three elementary affections, one from each of the three main directions, it should be possible (whether with or without recourse to the hypnotic state) to "suggest away" two of the components, and so allow the third to come to its full bodily expression. This method has not as yet received any extended trial.

It remains to consider the nature of the physiological processes that underlie the appearance of an affection in consciousness. Sensations are conditioned directly upon the excitation of a determinate sense-organ. Affections, in all probability, are conditioned by excitatory processes which arise indirectly, by way of reaction, from these first processes. The secondary excitations may be supposed to originate within the cerebral cortex, though some psychologists have referred them to the medulla, or even to the sympathetic system; but whether they are localized (Wundt) or diffused (Meynert), we have no means of deciding. The English school have found a biological sanction for their traditional doctrine of pleasure-pain in the law that whatever is pleasurable tends to further and perfect life, and whatever is painful to disturb or destroy it. The law appears to be substantially true. Expressed in psychological terms, it would run somewhat as follows: A pleasant stimulus is a stimulus of moderate intensity, permitting the full exercise of attention, and connecting with the organic sensations set up by "anabolic" bodily processes; an unpleasant stimulus is one the intensity of which is adverse to maximal attention, and which connects with the organic sensations set up by "catabolic" bodily processes. Pleasantness and unpleasantness would then be conditioned, in the last resort, upon the *intensity* of stimulus: a result which accords well both with the results of experiment and with the notion of a diffused cortical reaction as substrate of the affective process. On the other hand, as we have seen, later theory connects pleasantness and its opposite with the quality, excitement-depression with the intensity, and tension-relaxation with the duration of stimulus. No one has yet attempted to work out these correlations upon the biological or teleological side. Here, as before, we must look to the future for a settlement of the questions at issue.

Consult: for the theory of the three affective directions, W. Wundt, *Outlines of Psychology*, translated by C. H. Judd (Leipzig, 1897, 2 ed., 1902); for methods, O. Kuelpe, *Outlines of Psychology* (London, 1895); E. B. Titchener, *Experimental Psychology* (New York, 1901); for the teleological law, H. Spencer, *Principles of Psychology* (New York, 1881), *and Principles of Ethics* (New York, 1892).

AFFIDA'VIT (Perf. of Low Lat. *affidare*, "he has made an oath," from Lat. *ad*, to + *fides*, faith). A written declaration, or statement of fact, made before a magistrate or other person legally authorized to administer an oath, the truth of which is confirmed either by an oath sworn or a solemn affirmation. The name and designation of the party making the affidavit are written at length, and he usually signs it at the foot. When the paper is shown to him, he is required to swear or affirm that its contents are true, and that the name and handwriting are his, and it is thereupon attested by the officer before whom it is made. Affidavits in all the English courts must be taken and expressed in the first person of the deponent. In the United States, all judges, justices of the peace, notaries, commissioners, and some special officers, have authority of law to take affidavits. All the States appoint commissioners, residing in other States, to exercise the power. Generally the authority of foreign officials to take affidavits must be certified or verified in court. When a judge takes an affidavit in court, his signature must be authenticated. American ministers and consuls abroad have power to take affidavits, and so have British consuls and nearly all similar officers. No particular form of affidavit is prescribed. An *affidavit of merits* is one made by a defendant in an action, which sets forth that he has stated his case to counsel and is by him advised that he has a good defense to the pending action on its merits. This is required in certain cases to protect plaintiffs from delay by frivolous shows of defense, but does not always effect the purpose.

AFFIL'IA'TION (Low Lat. *affiliatio*, adoption as a son or daughter, from Lat. *ad*, to + *filius*, son, *filia*, daughter). In the civil or Roman law, the ascertainment of the parentage and determination of the descent of a person, either through the mother or the father. In our law the term is commonly used to designate the proceeding for the judicial determination of paternity, especially of the paternity of bastards. (See BASTARD.) In cases where the person seeking to establish his paternity was born during coverture, i.e., in lawful wedlock, there is a presumption of law that the husband was the father, which cannot be rebutted by direct evidence to show that he in fact was not the father, but only by proof that, owing to absence abroad, or in prison, or on the high seas, no cohabitation could have taken place, or that it was physically impossible. In French law, the term affiliation refers to a customary mode of adoption prevailing in some parts of France. See FILIATION.

AFFIN'ITY (Lat. *affinitas*). The relationship created by marriage between the husband and the blood-relations of the wife, and between the wife and blood-relations of the husband. It is to be distinguished from consanguinity, which signifies relationship by blood. There can be no inheritance by legal succession from a relation by affinity. The relations of the wife stand to the husband in the same degree of affinity in which they stand to the wife by blood or consanguinity, or *vice versâ*. But between the relations of the two parties by affinity there is no affinity. Thus, there is no affinity between the husband's brother and the wife's sister, and, by our law, there is no impediment to their marriage. The question as to whether those who are related by affinity stand in all respects in the same position as regards marriage as those who are connected by blood is one on which some difference of opinion at present prevails. Marriage between a man and the sister of his deceased wife is at present forbidden in England by statute, but not generally in the United States or the British colonies. See CONSANGUINITY; MARRIAGE, and the authorities there referred to.

AFFINITY, Chemical. The force that holds in combination the constituent elements of chemical compounds and causes the reactions taking place between material substances. The nature of chemical affinity is as little understood as the nature of gravitation, and the hypotheses on the subject, which have been advanced since the earliest times, are still confined within the domain of pure speculation. Borelli and Lemery imagined that the ultimate particles of matter were supplied with minute hooks, the shape of which determined the capacity of a particle for combining with certain other particles. Bergman, Berthollet, and others, thought that chemical affinity might be identical with the energy of gravitation. Berzelius sought to explain all chemical phenomena on the hypothesis that chemical combination was caused by the mutual attraction of electrically different substances. All these hypotheses, however, go no further in explaining the transformations of matter than did the ancient idea, according to which those transformations were due to the mutual love or hatred of the different kinds of atoms. Such ideas are incapable of either theoretical development or practical application, and science must, at least for the present, discard them as useless hypotheses and confine itself solely to the experimental study of the mode of action of the chemical forces, without reference to their ultimate nature. In this direction the science of chemistry has, in recent years, made considerable progress. The principles of thermodynamics have been successfully applied to many transformations, and certain general laws have been established, according to which all chemical reactions seem to take place. The second principle of thermodynamics proves that when a transformation takes place in a material system while no energy is being supplied to it from without, the system is capable of doing a certain amount of external work. The maximum external work which may be obtained through a transformation taking place under ideal conditions (that is to say, through a reversible isothermal process), may be taken as a measure of the tendency according to which the transformation takes place. In the case of a chemical transformation, that tendency is obviously the "affinity of the reaction." This maximum external work, done during a chemical reaction, or, as it is usually expressed, the change of free energy involved in a reaction, is ascertained either by studying reacting mixtures after they have reached the state of equilibrium, or, in the case of galvanic combinations, by determining the electro-motive force. See articles Reaction, Chemical, and Acids.

Bibliography. T. Bergmann, *Traité des affinités chymiques ou attractions electives* (Paris, 1788); C. L. Berthollet, *Researches Into the Laws of Chemical Affinity* (translated by M. Farrell, Baltimore, 1809); C. M. Guldberg and P. Waage, *Studien über die chemische Affinität* (original edition, Christiania, 1864; French translation, Christiania, 1867; German translation, Leipzig, 1879). See also bibliography of theoretical chemistry under Chemistry.

AFFOR′ESTA′TION (Lat. *ad*, to + Low Lat. *foresta*, a wood, forest). The converting of open or partially wooded ground into forest or woodland. See Forestry.

AFFRAY′ (Fr. *effroi*, fright, terror, compare Engl. *afraid*). The fighting of two or more persons in a public place in such a manner as will naturally cause terror to other people. It differs from assault (q.v.) in that it must occur in a public place, and from a riot (q.v.) in that only two persons are necessary for the commission of the offense. Two persons engaged, although in a public place, must each be guilty of unlawfully fighting the other or there is no affray. No matter how publicly, or in how terror-breeding a manner, A may attack B, if the latter does not go beyond the limits of self-defense in repelling the attack, the occurrence is not an affray, but an assault. An affray which did not develop into a higher crime, such as homicide or an attack upon a public officer, was punishable at common law by fine and imprisonment. In some of our States it is not recognized as a separate offense from assault and battery (q.v.). Consult: Wharton, *Criminal Law* (Philadelphia, 1896).

AFFRE, ȧfr', Denis Auguste (1793-1848). An archbishop of Paris. At the time of the Restoration he was professor of theology at the seminary of St. Sulpice, and on account of his prudent and temperate character was made Archbishop of Paris by the government of Louis Philippe in 1840. Though not yielding a blind submission to all measures of the Government, he abstained from all offensive opposition. During the insurrection in Paris in June, 1848, he climbed upon a barricade in the Place de la Bastille, carrying a green bough in his hand as a messenger of peace, and sought to persuade the insurgents to lay down their arms. He had scarcely uttered a few words when the insurgents and the troops commenced firing again, and he fell, mortally wounded by a musket-ball. He was removed to his palace, where he died, June 27. He was the author of several theological writings and of a work on Egyptian hieroglyphics. Consult: Castan, *Histoire de la vie et de la mort de Monsignor Affre* (Paris, 1855).

AFFREIGHT′MENT (Lat. *ad*, to + Engl. *freight*). The contract of a shipowner for the carriage of goods in his ship for compensation, or freight. The shipper is technically known as the *freighter*. Where the freighter ships his goods in the ordinary way, without acquiring any control over the ship, the contract is a bill of lading (q.v.), and the rights of the parties are mainly determined by the laws relating to common carriers. (See Carrier, Common.) Where the freighter charters the ship, the contract is known as a charter-party (q.v.), and has certain features, and is subject to certain rules, peculiar to the law of shipping. A complete treatment of the subject will be found in Scrutton, *The Contract of Affreightment, as Expressed in Charter Parties and Bills of Lading* (London, 1899).

AFFRONTÉ, ăf′frŭN-tȧ′ (Fr. p.p. "face to face," from Lat. *ad frontem*, to the face). In heraldry, a term applied to animals represented as facing the spectator directly, as the lion in the royal crest of Scotland.

AFFU′SION, or Pouring, Baptism by. See Baptism.

AFGHAN′, or Pukhtu (North Afghan), or Pushtu (South Afghan). A modern Iranian dialect which is spoken by about three million people. The Afghan language is divided into two great dialects, the southern and the northern. The differences between these two dialects are mainly phonological; thus, North Afghan *kh, j*, and initial *c* = South Afghan *sh, zh, k*. The Afghan is undoubtedly an Iranian language, although it has suffered many corruptions, especially in its vowel system. The dialect has many foreign loan-words, chiefly from the Persian, and through this from the Arabic, and from the Indian, particularly Sindhi. The Afghan literature is scanty and dates only from the sixteenth century. The poetry is copied closely after Persian models, although there exists a great mass of popular Afghan songs of true Oriental beauty. The French scholar J. Darmesteter (1849-94) made a collection of these. Reference may be made to Geiger, *Sprache der Afghanen*, in Geiger and Kuhn's *Grundriss der iranischen Philologie*, V. 1, pt. 2, 201-230 (Strassburg, 1898), and works cited. Consult: J. Darmesteter, *Chants populaires des Afghans* (Paris, 1888-90), which contains an historical sketch, a grammar, texts, and translation; Lorimer, *Grammar and Vocabulary of Waziri Pashto* (Calcutta, 1902).

AFGHANISTAN, ăf-găn'ĭs-tăn'. A country in Central Asia, between British India and Persia. It is situated between lat. 29° and 38° 30' N., and long. 61° and 75° E. (Map: Afghanistan, J 4; Asia, F 5). It is bounded by Russia, Bokhara, and the Pamir on the north, British India on the east, Baluchistan on the south, and Persia on the west. Its total area is estimated at 225,000 square miles. It is generally divided into five parts: (1) The northeastern part, comprising Badakhshan, Kafiristan, and a portion of the Pamir; (2) Afghan Turkestan, in the north; (3) Kabulistan, or the region of Kabul, in the east; (4) Southern Afghanistan, which comprises Kandahar and the country south, down to the Baluchistan boundary line; (5) the province of Herat, in the west. The political divisions of Afghanistan, however, are far from coinciding with its ethnographical or geographical divisions, as there are still numerous independent khanates and tribes which do not fully recognize the authority of the Ameer.

Physical Features. The surface of Afghanistan is exceedingly mountainous, a great part of it being covered with the mighty chain of Hindu-Kush and its offshoots. The Hindu-Kush extends in a northeast and southwest direction for about 400 miles to the Irak and Shibar passes, where it assumes the name of Koh-i-Baba. Its highest peaks are over 20,000 feet above the sea, and the passes of Irak and Shibar on the route from Afghan Turkestan to Kabul are 12,000 feet and 8000 feet high respectively. The Koh-i-Baba chain branches off into two ranges, the Safed-Koh and Siah-Koh. Another branch is sent off by the Hindu-Kush above the Sirak Pass, which is called the Paghman Mountains. They run in a southwestern direction, and eventually unite with the Suleiman Mountains, which traverse the eastern part of Afghanistan. Besides the above mentioned principal chains, there are many secondary ranges and single mountains too numerous to describe.

The principal rivers of Afghanistan are the Heri-Rud, which flows through the Herat Valley; the Helmand, the largest river of Afghanistan, which rises near the Bamian Valley and flows in a general southwestern direction, entering the Lake of Hamun; the Kabul, a tributary of the Indus, and the Amu-Daria (Oxus), which forms the northern boundary of Afghanistan.

The climate is generally healthful and dry, although there are great variations of temperature, which rises as high as 100 degrees in the summer and falls as low as 10 degrees in the winter. The rainfall is very scanty, even during the rainy season, and for agricultural purposes a system of irrigation, called *karez*, is maintained. It consists of subterranean channels connecting the springs with one another, by which the water is brought to the surface.

The mineral deposits of Afghanistan are supposed to be very rich, but so far the expectations have not been realized. Iron, lead, and sulphur are worked on a small scale, and gold is found in small quantities in some of the hills and rivers, while precious stones are known to exist in Badakhshan.

The flora is very rich in the valleys, while the mountains are all barren, except those in the north, which are covered with forests to an elevation of 10,000 feet. The main products are wheat, corn, rice, grapes, sugar, tobacco, and cotton. The country is especially famous for its fruits, which include apples, pomegranates, and peaches of an excellent quality. Vegetables are also grown to a considerable extent, and a very important product is the asafœtida, a resinous gum exported in large quantities to India.

The fauna includes the leopard, wolf, bear, cheeta, hyena, jackal, various gazelles, and wild asses. Among the domestic animals may be mentioned the horse, the dromedary, ass, cow, two kinds of sheep, and the goat.

Agriculture and Trade. The soil of Afghanistan, where it is fit for agriculture, is generally very fertile and in most cases yields two crops a year. Wheat, barley, peas, and beans are sown late in the fall and ripen in the summer, while rice, millet, and corn are sown in the spring and harvested in autumn. The breeding of domestic animals is carried on extensively, and wool forms one of the chief exports to India. Owing to the practical absence of any manufacturing industries, the exports of Afghanistan are confined largely to raw products, such as wool, cattle, silk, and dried fruit. Some rugs, felts, and silk articles are produced on a small scale. The trade is chiefly with India and Bokhara. The mountainous character of the country makes the use of wheeled vehicles in most cases impossible, and merchandise is usually carried on camels or ponies.

Ethnography. The Afghans, or Pathans, speaking a language called Pukhtu, or Pushtu, form three-fifths of the population of Afghanistan. They are of mixed ancestry, although the Indic affinities of their language indicate a preponderance of Aryan blood of the Mediterranean stock. They are not Semites, as some authorities have believed, their national claim to an Israelitish descent being an afterthought based upon the occasional appearance among them of Jewish traits. Besides a dash of Semitic blood, they have in all probability inherited some of a different sort from the earlier inhabitants of the country, who may have been akin to the Dravidians of India. Among the principal tribes are the Duranis of the west and south, Ghilzais in the east, and the Yusufzais and Afridis on the Indian frontier. Less important Afghan tribes are the Swatis, Waziris, Kakars, Khostis, etc. Some other peoples of Afghanistan, such as the Tajiks, Hindkis, Jats, Aimaks, and Hazaras (Mongolians), are not Afghans, while the Kizilbashes are largely Persianized Turks. The Afghans were already well established in their present habitat when the Greeks reached India in the fourth century B.C. Most of the Afghan and allied peoples are agriculturists, but the dominant tribes compel the inferior ones to do the work. Physically the Afghans are well developed, and are of a very warlike disposition. Nearly all the tribes scattered along the east of Afghanistan and the northwest frontier of India are within the sphere of British influence. The population, according to the statistics available, is about five millions.

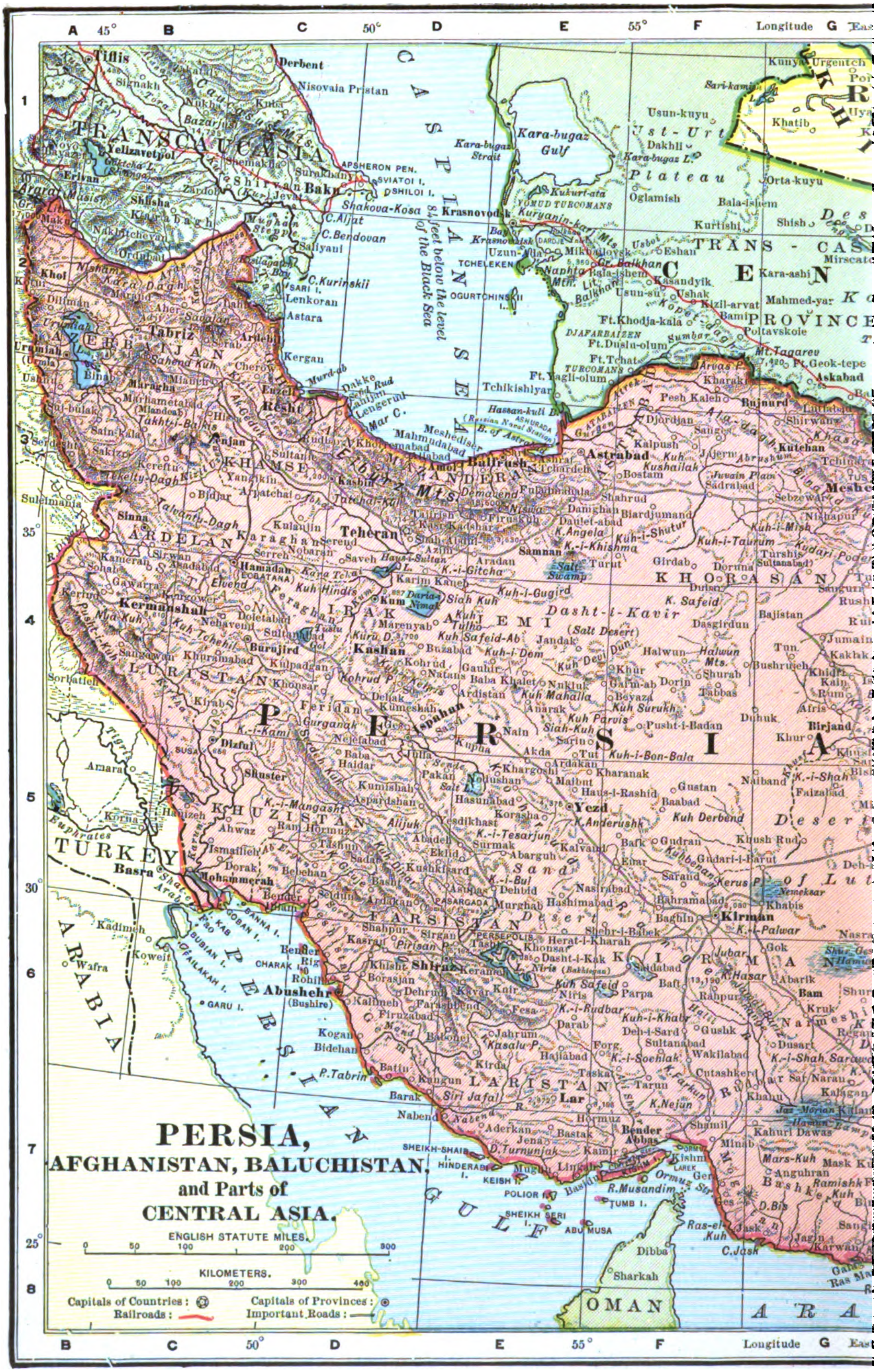
GOVERNMENT. The government of Afghanistan is a semi-feudal monarchy. The ruler is known as the Ameer. The country has but a loose governmental organization, and the authority of the Ameer varies with the personality of the ruler; many of the tribes still preserve a more or less turbulent and independent existence. The depredations of the border tribes on Indian territory have afforded the British Indian government excuse and opportunity for pushing forward the military frontier. The warlike Afridis and a considerable proportion of the Pathan tribes are now under British control. Frequent conflicts occur between the British troops stationed on the northwest frontier, particularly those of the Pashawar district in the Punjab, and the Pathan and Afridi tribes of Afghanistan. The latter are of greater political consequence because of their location, the importance of the Khyber Pass to India, and the necessity of maintaining a clear road from India to Kabul.

The Ameer is an hereditary prince, and his power is absolute. The whole country is divided for administrative purposes into the four provinces of Kabul, Turkestan, Herat, and Kandahar and the district of Badakhshan and its dependencies, administered by governors. The native code of laws is more or less equitable, but is not strictly enforced. The revenue is exacted in kind, and varies according to the condition of the crops. The Ameer receives an annual subsidy of 1,800,000 rupees from the Indian government. Afghanistan has a regular army modeled after European fashion. Its strength is not accurately known, but it is estimated at 44,000, including 7000 cavalry. There is an arsenal, and an ammunition factory at Kabul is equipped with English machinery. The medium of exchange is the rupee. There is a mint at Kabul under the supervision of an Englishman, but its operation is very limited. Instruction is supplied by the Mohammedan schools. The chief cities of Afghanistan are Kabul, Kandahar, and Herat. Among the towns of Afghan Turkestan are Balkh, Kunduz, Maimene, Andkhui, Tashkurgan, Aktcha, and Mezar-i-Sherif.

HISTORY. The country now known as Afghanistan was embraced in the ancient Aria. It was a part of the conquests of Alexander the Great, who founded Alexandria Arion, the modern Herat, and also, it is supposed, the modern Kandahar and a settlement near Kabul. Its masters changed many times in the waves of conquest that rolled over Asia. On the decline of the Bagdad caliphate it was included in the domains of the Samanides, one of the many independent dynasties that then arose in the Mohammedan world. The Samanide princes were overthrown by a Turkish tribe, who founded the Ghaznevide dynasty, and Afghanistan was a part of their realm until the fall of the Ghaznevides in 1186. It was overrun by the conquering Mongols of Genghis Khan in the first quarter of the thirteenth century, and in the last quarter of the fourteenth it was subjugated by the great Tartar conqueror Timur. In 1504 Baber, a descendant of Timur and founder of the Mogul empire, made Kabul his first capital, and Afghanistan remained a part of that empire until its decline. In 1722 Mahmud, an Afghan chieftain, invaded Persia, captured Ispahan, and dealt a permanent blow to the prosperity of that famous capital; but a few years later the Afghans were defeated and driven out by Nadir Kuli, a Persian soldier of fortune, who became by his great ability Shah of Persia, and the last of the conquerors of Afghanistan. After the assassination of Nadir Shah (1747), one of his officers, Ahmed (see AHMED SHAH), founded the Durani dynasty in Afghanistan, and that country has since maintained an independent existence. Ahmed made considerable conquests in India, and maintained a mastery over the Sikhs and Mahrattas, but established no permanent sovereignty. The Durani dynasty fell in 1809, and Shah Sujah, the grandson of Ahmed, became an exile.

Upon the fall of Shah Sujah anarchy ensued, a condition not unfamiliar to the warlike and restless Afghan tribes. The statesmanlike Dost Mohammed succeeded in establishing his authority over the eastern part of the country with Kabul as his capital. Shah Sujah from his asylum in India carried on intrigues for the restoration of his sovereignty, and succeeded in making an alliance with Runjeet Singh, the Sikh ruler. A small subsidy was also obtained from the Anglo-Indian government, and Afghanistan was invaded. The only result was to involve the Afghans and the Sikhs in unprofitable warfare, while Sujah soon returned to India. When Lord Auckland became Governor-General of India, he declared a policy of non-interference in questions concerning the native states; but in direct contradiction of this declaration, in 1838 his government actually undertook to restore Sujah, alleging that Dost Mohammed had attacked Great Britain's ally, Runjeet Singh; an attack, it may be noted, for which there had certainly been reason enough. It was further alleged that the military operations of the Afghans had betrayed a hostile purpose toward India; and that Shah Sujah, as the rightful heir to the Afghan throne, had placed himself under British protection. The British forces advanced through the Bolan Pass to Kandahar, where Shah Sujah formally claimed possession of the country. On July 21, 1839, the army encamped before Ghazni, and after some hard fighting that fortress was taken. On August 7, Shah Sujah, with the British forces, entered Kabul, and the conquest was regarded as complete.

In this, however, as in all their dealings with the Afghans, the British showed an entire misunderstanding of the nature of the country and the character of the people. The land had been invaded, but was by no means conquered. Dost Mohammed had surrendered to the English; but his son, Akbar Khan, was actively engaged in a conspiracy, of which the British envoy, Sir William Macnaghten, and his successor, Sir Alexander Burnes, were not aware until it was too late. Early in the winter of 1841, when help from


PERSIA,
AFGHANISTAN, BALUCHISTAN,
and Parts of
CENTRAL ASIA.
ENGLISH STATUTE MILES.
0
50
100
200
300
KILOMETERS.
0
50
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300
400
Capitals of Countries :
Railroads :
Capitals of Provinces :
Important Roads :
Longitude
TRANSCAUCASIA
CASPIAN SEA
84 feet below the level of the Black Sea
Kara-bugaz Gulf
Ust-Urt Plateau
TRANS-CASPIAN PROVINCE
AZERBIJAN
KHAMSE
MAZANDERAN
ASTRABAD
ARDELAN
IRAK AJEMI
KHORASAN
Dasht-i-Kavir (Salt Desert)
LURISTAN
KHUZISTAN
PERSIA
FARSISTAN
LARISTAN
KIRMAN
Sand Desert
TURKEY
ARABIA
PERSIAN GULF
OMAN
Teheran
Tabriz
Ispahan
Yezd
Kirman
Shiraz
Abushehr (Bushire)
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Basra
Baku
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Resht
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Askabad
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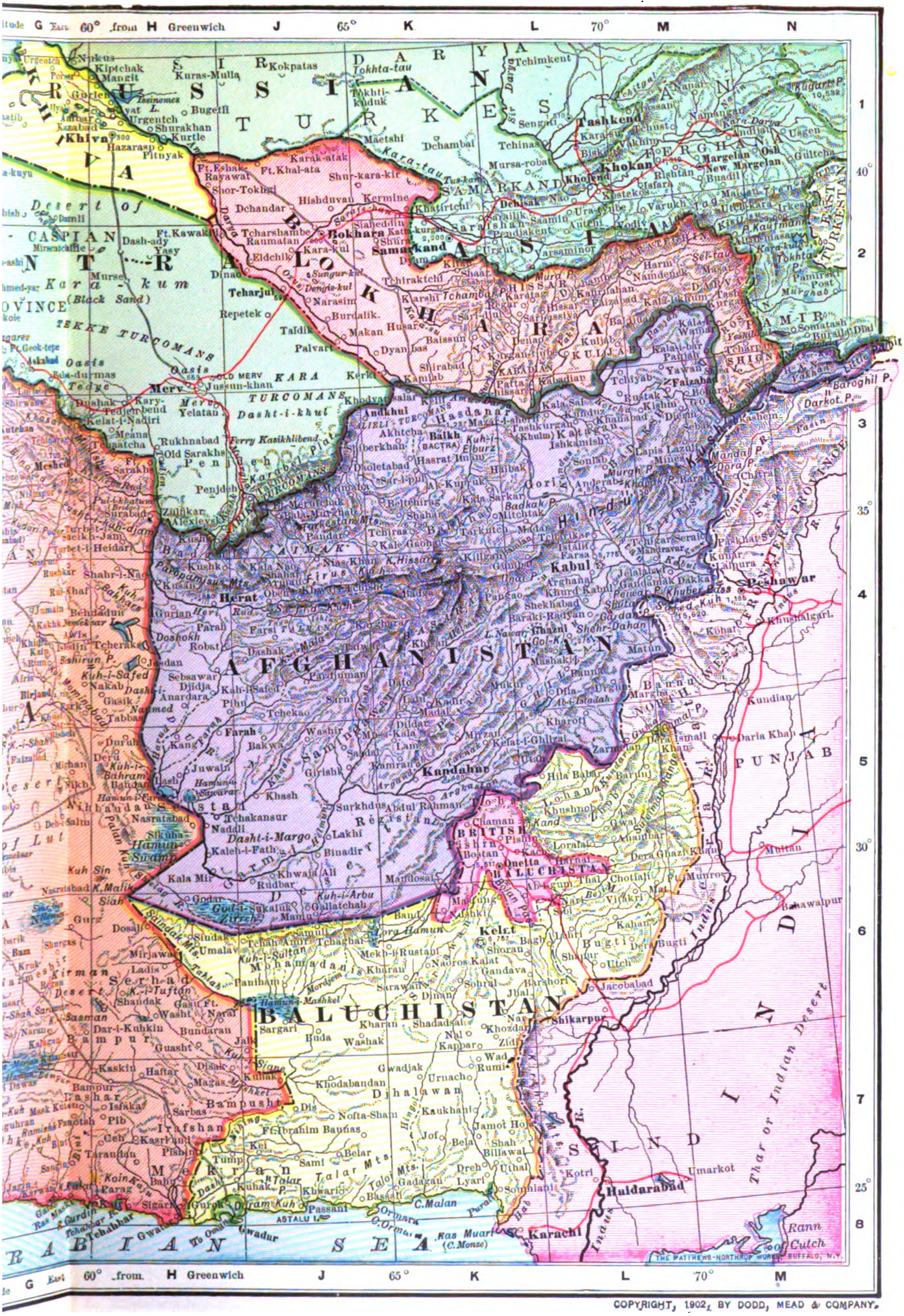

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India was impossible, the outbreak took place at Kabul. Burnes, Macnaghten, and several British officers were slain. It was then agreed that the invaders should leave the country; while, on the other hand, Akbar Khan and his confederates stipulated to provide an escort and make other necessary arrangements for the retreat. Depending on these promises, the British army left Kabul on January 6, 1842, in order to return by the Khyber Pass into India; but neither escort nor provisions were supplied by the Afghan leaders, and the severity of the season increased the misery of the retreat. The fanatical tribes of the districts harassed the flanks and rear of the army. To escape total destruction, the women and children, together with the married men, surrendered to Akbar Khan, and out of the 16,000 souls that had set out from Kabul, only one man (Dr. Brydon) escaped to carry the dismal tidings to General Sale, who still held his position at Jelalabad. Almost against his own will, the new Governor-General, Lord Ellenborough, sent other forces into Afghanistan. General Nott held out at Kandahar, while General Pollock, at the head of the invading army, forced the Khyber Pass, relieved General Sale, and effected a victorious march to Kabul, which he entered in September. The English officers and the women who had surrendered as prisoners to Akbar Khan were restored to liberty, and soon afterward the troops marched back to India. It was believed that the Afghans were deprived of all power to confederate against the government of India; but this conclusion was too hasty, for in 1846 they formed an alliance with the Sikhs against the British, Dost Mohammed being released and permitted to reoccupy his throne. After the decisive battle of Gujerat (February 21, 1849), the Sikhs were forsaken by the Afghans, and Dost Mohammed, with about 16,000 men, fled over the Indus. After this period, Dost Mohammed devoted his attention almost exclusively to the consolidation of his dominions, governing well, and always seeking to maintain friendly relations with the Anglo-Indian government. He died in 1863, appointing Shere Ali, one of his younger sons, as his heir. At first the choice was acquiesced in by the sixteen sons of Dost Mohammed, a large number of whom were governors of provinces; but disputes followed, which for many years kept Afghanistan in a state of anarchy. (See KABUL.) The British government of India had recognized Shere Ali at his accession, and it was the policy of Lord Lawrence's administration in India to abstain from any interference with Afghan affairs. Lord Mayo assumed a like attitude. The claims of Shere Ali's son Yakub to share in the government were ignored, and in 1870 he headed a rebellion against his father; but in the following year a reconciliation was effected through the intervention of England. In 1869 it was settled between England and Russia that all the territory between the Amu-Daria and the Hindu-Kush should be treated as part of Afghanistan. The British conservative government which came into power in 1874 was totally opposed to the policy of non-interference, and the Indian government was ordered to insist upon the reception of a British resident at Kabul. This demand was made imperatively in 1878, when a Russian mission had been received. The Afghans, remembering Burnes and Macnaghten and their double dealing, were bitterly opposed to any more British residents, and the refusal of the Ameer to receive the mission led to the second Afghan war, which in many ways was a repetition of the first, although the disasters were somewhat mitigated. The British invading columns forced the Khyber Pass and were victorious at the Peiwar Pass, and occupied Jelalabad before the end of 1878. In Jaunary, 1879, they entered Kandahar. A few weeks later Shere Ali died, and his rebellious son, Yakub, whose cause had been taken up by the British, was proclaimed Ameer and concluded the Treaty of Gandamak with them in May. It was provided that there should be a British resident at Kabul, and that Great Britain should defend Afghanistan against foreign aggression, the Ameer receiving a subsidy. The Kuram, Pishin, and Sibi valleys became British territory, and the Khyber Pass came under British control.

The peace did not last. In September of the same year there was a revolt in the capital, the British resident, Sir Louis Cavagnari, and his suite were murdered, and the British troops, which were on the point of withdrawing from the country, were compelled to renew the campaign. The Kabul army under General Roberts was the strongest column and held the key to the situation. General Burrows was defeated by the Afghans in July, 1880, and compelled to retreat to Kandahar, which seemed likely to be captured. It was saved by the brilliant march of General Roberts with a strong force from the main army, a march which won for him a peerage with the title Lord Roberts of Kandahar. Abd-ur-Rahman (q.v.) having been accepted as Ameer by the Afghan chiefs, was recognized by Great Britain; which abandoned its claim to maintain a permanent mission at Kabul and agreed to pay to the Ameer an annual subsidy of 12 lakhs of rupees (about $400,000). Abd-ur-Rahman established his government firmly and maintained a good understanding with Great Britain while not antagonizing Russia. In 1893 he concluded the Durand agreement with the Indian government, in which he recognized the Chitral, Bajaur, and Swat as within the sphere of British influence and withdrew his pretensions to Waziristan. Great Britain in return abandoned its claims upon Kafiristan which was subsequently occupied by the Afghan forces, and increased its subsidy to 18 lakhs (about $600,000). Abd-ur-Rahman died October 1, 1901, and was succeeded by his son Habib Ullah (q.v.). On March 21, 1905, the Ameer signed a treaty with the British commissioner, Mr. Louis Dane, providing for a continuance of the terms of the agreement of 1893.

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AFINGER, ä'fĭng-ĕr, BERNHARD (1813-82). A German sculptor, born at Nuremberg, Bavaria. He studied the works of old German sculpture there, was for a time a silversmith, and in 1840 began instruction under Rauch at Berlin. In portrait medallions and works of a religious character he was particularly successful. There is an Arndt memorial by him at Bonn, a university memorial at Greifswald, and a statue of Newton in the National Museum, Pesth.

AFIUN-KARA-HISSAR, ȧ'fē-ōōn'kȧ-rä'-hĭs-sär' (Turk., Opium Black Castle). A city of Anatolia, Asiatic Turkey, 170 miles northeast of Smyrna (Map: Turkey in Asia, D 3). It is surrounded by rocky hills, on one of which are found the ruins of a castle. The town contains several mosques and Armenian churches. It manufactures woolen carpets and opium, the latter being one of the chief articles of commerce, from which the town derives its name. The trade is considerable. The town is connected by rail with Smyrna, Constantinople, and Konieh. Pop., about 20,000.

AFRAGOLA, ä'frȧ-gō'lȧ. A city in south Italy, five miles northeast of Naples, noted for the manufacture of straw goods. Pop., 1881, 19,000; 1901, 22,438.

AFRA'NIUS, LUCIUS. A Roman poet and playwright, who lived about 100 B.C. He was praised by Cicero and Quintilian for the excellence of his plays, only the titles and a few fragments of which survive. They are collected by Ribbeck, *Comicorum Romanorum Fragmenta* (Leipzig, 1898).

AF'RICA (Lat. *Africa*, from *Afer*, inhabitant of Africa; of uncertain derivation, possibly of Phœnician origin. It seems to have been originally the designation of Carthage, as the colony of Tyre, and later extended to the whole continent. It is certain that the name Africa was first applied to the neighborhood of Carthage—the part first known to the Romans—and *Afrygah*, or *Afrikiyah*, is still applied by the Arabs to the land of Tunis). A continent of the eastern hemisphere, and in point of size the second of the great land divisions of the globe, with an area of about 11,250,000 square miles, exclusive of islands. The continent ranks third in size only by virtue of an unwarranted composite naming of the American continents. Africa is an independent continent in even less degree than is either of the two Americas, for it forms the southwesterly extension of the Old World land-mass, and it lies in close proximity to Asia and Europe, with both of which continents it has, during long periods of past geological time, been intimately united by broad isthmuses. In form Africa consists of two parts, a northern ellipsoid, with an east and west longitudinal axis, comprising the Sahara-Sudan region, and a southern triangular limb attached to the southern side of the eastern half of the northern portion, and consisting of the Congo region and the South African highlands. Somewhat north of the middle point of the eastern side of the continent, a massive triangular projection, the Somali Peninsula, extends almost 1000 miles toward the Indian Peninsula of Asia. The extreme length of Africa from Cape Blanco in Tunis (lat. 37° 20′ N.), its most northerly point, to its southern termination, Cape Agulhas (lat. 34° 51′ S.), is about 5000 miles in an almost north and south direction; and its greatest width from its western outpost, Cape Verde (long. 17° 30′ W.), to its eastern apex, Ras Hafun, on Cape Guardafui (long. 51° 28′ E.), is about 4500 miles in an almost west and east direction. The northern and southern points of the continent are almost equidistant from the equator; so that Africa, compared with South America, has a greater proportion of its area situated in the torrid zone.

At its northeast corner, by the Isthmus of Suez, Africa has a geographic union ninety miles wide with Asia. Until a comparatively recent period it had a much closer union, for the Red Sea and the Gulf of Aden now occupy the deep, narrow basin of a rift valley that has been formed since Pliocene time. On the north, the Mediterranean Sea separates Africa from Europe by a wide and deep basin that is restricted at its western end, so that the shores of Spain and Morocco approach to within about nine miles of each other. This northern Mediterranean coast is broken only by the broad and shallow embayment that holds the gulfs of Cabes and Sidra. The western extension, from Gibraltar to Cape Palmas, projects into the Atlantic Ocean with a regularly rounded coast line that is almost unbroken by bays or peninsulas, capes Blanco and Verde being inconspicuous projections. From Cape Palmas the coast runs eastward along the north shore of the Gulf of Guinea for about 1200 miles to Kamerun and thence in an undulating line, slightly east of south, for nearly 3000 miles to Cape Agulhas at the southern extremity of the continent, where the Atlantic and Indian oceans meet. The eastern coast of the southern limb, washed by the Indian Ocean, extends from Cape Agulhas with gentle curves for 3600 miles to Cape Guardafui at the apex of the Somali Peninsula.

The coast line of Africa is peculiar in that it presents a remarkably even front, almost unbroken by bays and peninsulas, contrasting strongly in this respect with the coast lines of Europe, Asia, and North America, but resembling that of South America. The length of the coast line of Africa, 18,400 miles, bears a smaller proportion to the shortest possible periphery of a regular figure of its own area (the proportion is 1.8 to 1) than does that of any other continent. The only irregular portion of the coast line is on the northern edge, where the Atlas Mountains send spurs into the Mediterranean Sea. This regularity of the shore line is undoubtedly due to the plateau character and the stability of the larger part of the continent, which during great periods of geological time has stood emerged at approximately the same level above the ocean.

ISLANDS. In connection with the regularity of the coast line, it is of interest to note the small number of islands adjacent to this continent, and also the small proportion of these that have any physical relations with the mainland.

Madagascar, off the eastern coast, is the only large island near the continent; it was at a distant period of geological time an integral part of the mainland, but it is now separated from it by the Mozambique Channel, which appears to be a rift valley analogous to that of the Red Sea. The Seychelles, the islands in the vicinity of Zanzibar (Mafia, Zanzibar, and Pemba), and Socotra, off the apex of the Somali Peninsula, may be considered as fragments of the continental mass, while many of the small islands along the east coast, including those in the Red Sea, are of volcanic and coral reef origin, and rise apparently from submerged portions of the continental plateau. On the Mediterranean coast the islands of Jerba and Kerkenna in the Gulf of Cabes were formerly united to the mainland, and in past geological times even the island of Sicily was part of a chain of folded mountains that extended from the Tunisian highlands northeastwardly across the Mediterranean Sea. Off the western extension, the Madeira, Canary, and Cape Verde archipelagoes are of volcanic origin, and appear to lie on the outer submerged slope of the continent, perhaps marking lines of folding and fracture that are extended under the ocean level. The Bissagos group, thirty in number, lying a short distance south of Cape Verde, are small fragments of the mainland. From the Bissagos group, the coast is free from islands as far as the head of the Bight of Biafra, where four volcanic islands, Fernando Po, Prince, St. Thomas, and Annobon, extend in a southwestward direction from Mount Kamerun on the coast. Southward from this point the coast has but few islands, and these of small size, all the way to the Cape of Good Hope; and this same condition, in even more marked degree, is continued along the eastern coast for 2500 miles to the island of Mafia. The small extent of Africa's island territory is expressed by its proportion to the mainland area, which is as 1 to 48.

TOPOGRAPHY. The typical expression of African topography is that of a plateau that rises here and there by successive terraces to increasing elevations up to and beyond 4000 feet, which altitude is the general level of the highland region that covers a large part of the southern and eastern portion of the continent. The edges of the continental mass are as a rule somewhat more elevated than is the interior, and the plateau rims approach close to the sea. Only along the eastern part of the Mediterranean shore and along that part of the Atlantic seaboard between Cape Juby, near the Canaries, and Freetown, can there be said to exist a coastal plain that extends for any considerable distance toward the interior. Swampy districts of limited extent are found along the upper Guinea shore and on the east coast about the mouths of the Zambezi River, and a lowland borders the south side of the Somali Peninsula. The mean elevation of Africa, obtained by a reduction of all irregularities of the surface, has been estimated to be about 2100 feet, which is about equal to that of South America and somewhat less than that of North America, while it is greatly exceeded by the mean elevation of the Eurasiatic continent.

The topography of the interior presents over large areas a marked uniformity of expression, though different regions exhibit distinctive features. The general plateau character of the surface is broken in the interior of the continent by four areas of depression which in the south and north are occupied by basins of internal drainage. In the southern highland is the Kalahari-Ngami Desert (altitude 2250-3000 feet); the central plateau falls toward its middle to form the Congo Basin (altitude 600-1600 feet); in the central Sudan the Lake Chad (altitude 900 feet) and Bodele (altitude 500 feet) depressions receive the drainage of a great interior region that has no outlet to the sea; and in the northwestern Sahara several inclosed basins lie at altitudes of from 400 to 600 feet above the ocean.

Africa is divided topographically into the following regions: (1) the elevated Southeastern Highlands, (2) the Sahara and Sudan plateau of lower level that covers the entire central and most of the northern part of the continent, and (3) the narrow, comparatively small area of the Atlas Mountains on the extreme northwest coast. On the whole, the general slope of the surface is from the southeast to the northwest.

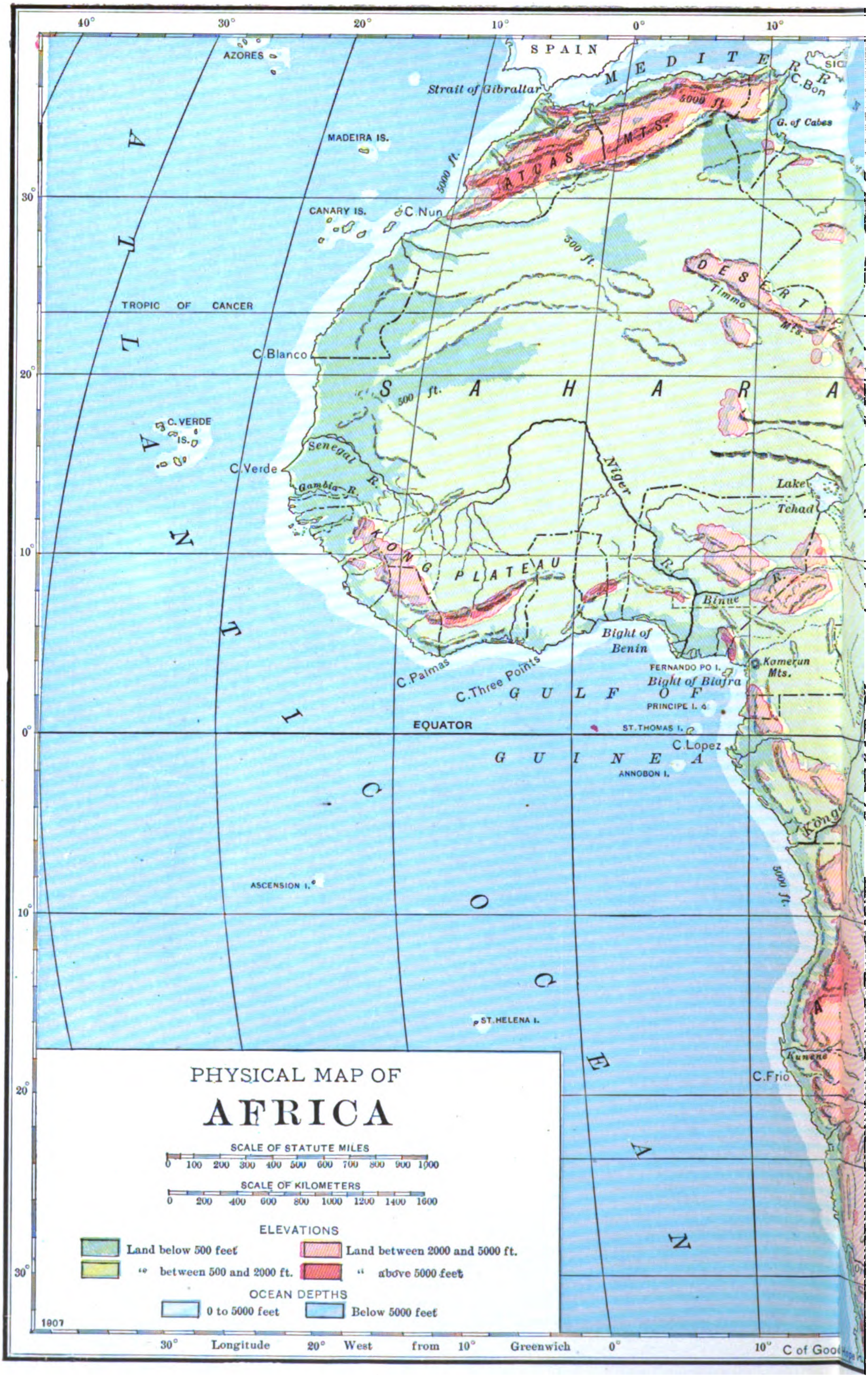
The highest portions of the continent, called the Southeastern Highlands, lie near the eastern coast and in the lower end of the southern limb. They are limited on the north by an irregular line that may be drawn from Loanda on the west coast, at the mouth of the River Kuanza, eastward to Ankoro on the Upper Congo, thence northward to Daruma, and through Lado and Kassala to Suakin on the Red Sea. Northward from Suakin the eastern highland is continued as a narrow ridge of lower elevation along the western shore of the Red Sea almost to Cairo. This great highland region may be topographically considered to form the backbone of the continent, though it is scarcely that in a geologic sense, for the rocks of which it is composed lie generally horizontal, and the differences of topography are the result of long continued erosion and denudation rather than of mountain-making forces. This highland has an elevation of over 4000 feet, and above this height rise numerous isolated and grouped peaks to altitudes of 10,000 feet and over. The majority of these high peaks are remnants of a dissected plateau of still higher level, while others are volcanic mountains that rest upon the table-land and rise above it to still greater heights of from 12,000 to 20,000 feet. The central depression of the Kalahari Desert and Ngami Basin in the southern part of the highland, and the deep valleys cut by the rivers that drain this interior basin, serve to divide this southern region into four well-marked isolated plateaus. The most southerly plateau occupies the Cape, Natal, Orange River, and Transvaal colonies, and their seaward edges, known as the Roggeveld, Schnee, Zwarte, and Drakenberg mountains, rise in single peaks of 9000 to 11,000 feet. North of the Transvaal, between the Limpopo and the Zambezi valleys, is the less extensive plateau of Matabeleland, with an average level of 4500 feet and a single peak (Mashona Mountain, 7300 feet), near its eastern edge. On the western side of the continent, between the Kalahari-Ngami Basin and the Atlantic coast is the plateau of German West Africa, covering Damara and Great Namaqualand. This plateau rises to somewhat lesser single heights than does the plateau of British South Africa: Kara (6500 feet), Awas (6530 feet), and Omatoka (8700 feet). Northward of all these, and extending from west to east through Angola and British Central Africa to the vicinity of lakes Nyassa and Tanganyika, where it joins the great eastern highland, is a broad plateau 750 miles wide from north to south and 1500 miles from west to east, with a general elevation of 3000 to 6000 feet. This forms the divide between the Ngami and Zambezi basins on the south and the Congo waters on the north, and has its highest points on the west end in the plateau of Bihe (Lovili Mountains, 7800 feet), and at the eastern end in the plateau mountain of Chitane (6500 feet) near Nyassa Lake. Toward the south it slopes gradually to the Ngami and Zambezi basins, and toward the north it falls more abruptly to the Congo region. Near the eastern end are two lakes, Moero or Meru (3000 feet), and Bangweolo (3700 feet), that drain into the Upper Congo River.

Stretching northward from the Zambezi River to the Red Sea is that great eastern highland which attains its most extensive development just south of the equator in the region about the Victoria Nyanza. Through a large part of its extent this highland maintains an elevation of over 5000 feet, which in Abyssinia rises over considerable areas to heights of six, eight, and ten thousand feet. The main highland extends northward nearly to Suakin, and a narrow, interrupted spur reaches eastward from lakes Abba and Zuway to the apex of the Somali Peninsula, with peaks declining in height from Mount Mulata (9840 feet) to Godobb (4875 feet) at Cape Guardafui. The surface of this eastern highland is traversed longitudinally by a great system of so-called rift-valleys that constitute the most important feature of East African topography, and with which is associated a system of great lakes. These rift-valleys mark the course of parallel cracks in the earth's crust, between which the surface has sunk for thousands of feet, forming narrow, elongated depressions, or broad cañons, with precipitous walls that rise to the broken edges of the high-level plateau. In these rift-valleys lie the majority of the great African lakes, most of which, consequently, are of elongated form. The longest of these rifts has its northern end in Palestine, in the Jordan and Dead Sea valleys; it forms the Red Sea Basin southward to the Straits of Bab-el-Mandeb, where it is joined by a broader rift that comes from the east, forms the Gulf of Aden, and continues southwestward through French Somaliland and the Galla country into British East Africa to lakes Stephanie and Rudolf. At this point the rift-valley divides. One branch continues southward to beyond Lake Manyara, and another trends westward from Lake Rudolf to Lake Albert, and then southward to Lake Shirwa at the southern end of the eastern highland. In addition to these great rift-valleys there are many smaller fracture lines throughout the entire highlands that exercise considerable control over the smaller drainage features.

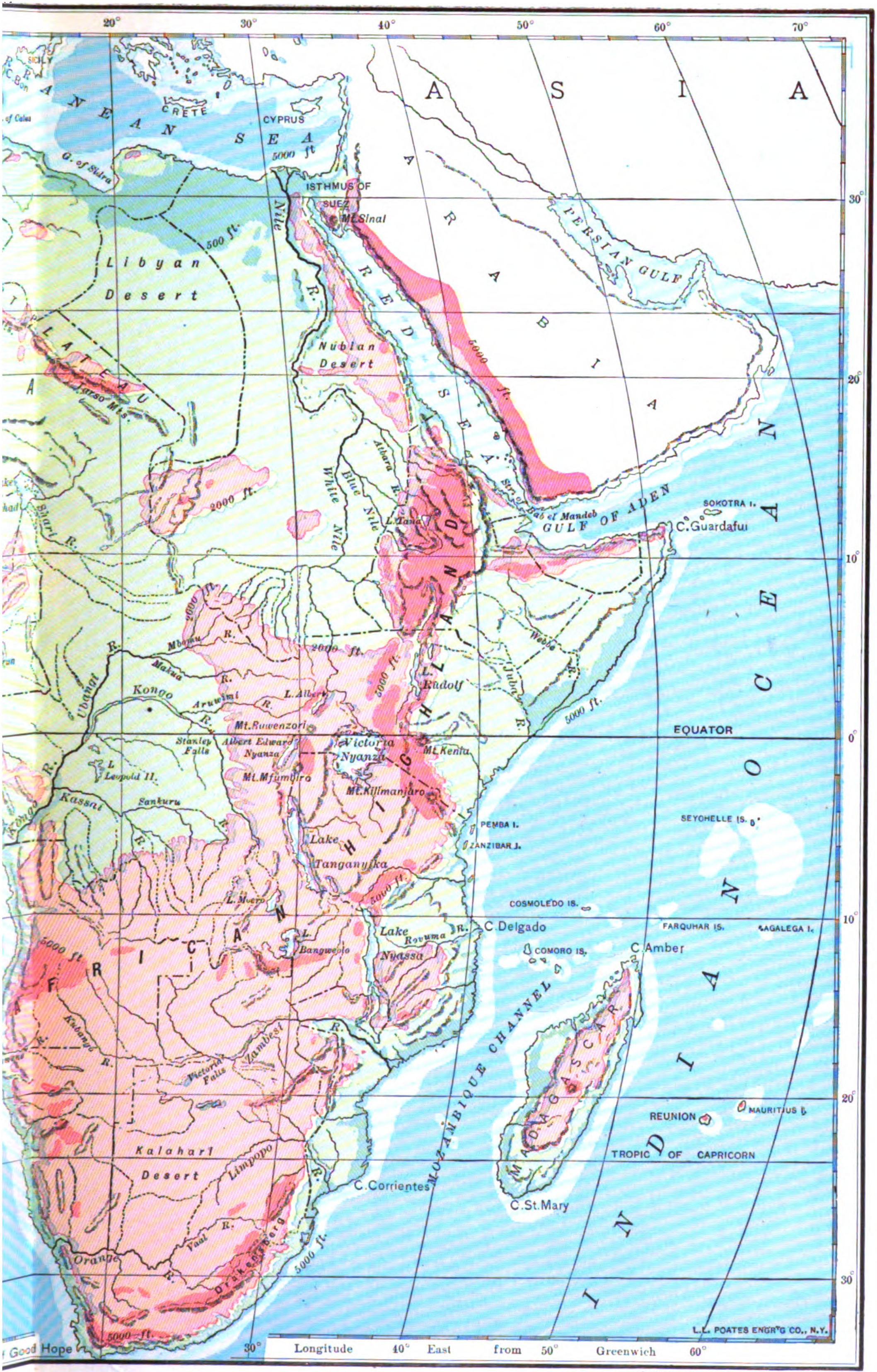
In the vicinity of the rifts are found the highest mountains, and in general the courses of the great rifts mark the location of volcanic peaks. The massive, snow-topped Ruwenzori Range, with its central peak rising to 16,600 feet, is among the most important of African mountain ranges, and it appears to be largely of volcanic or laccolitic origin. South of Lake Albert Edward, on the eastern side of the western rift-valley, is a group of volcanic mountains, some of which are active, culminating in Mount Kirunga (4350 feet). The most extensive volcanic district, however, lies along the eastern rift-valley and on the Abyssinian highland. Kilimanjaro (19,720 feet) and Kenia (17,200 feet), two isolated, snow-clad, volcanic peaks, rise from the eastern margin of this rift-valley near its southern termination. About the southern half of Lake Rudolf is a series of volcanic peaks, where several active cones rise 2000 feet above the plains, the best known of which is Teleki. Several very high mountains lie between Lake Rudolf and the Victoria Nyanza, the highest of which is Mount Elgon (14,030 feet). The Abyssinian highland is topped by massive fields of ancient lava, from which rise extinct volcanic peaks to heights of about 15,000 feet (Mounts Dashan, Abba-Yared, etc.). A few active volcanoes occur on the northeastern slopes of Abyssinia, near the shore of the Red Sea, where a chain of mountains presents summits of 9000 to 10,000 feet.

The great topographical feature of West Central Africa is the Congo Basin, equaling in area the basin of the Mississippi, and stretching from lat. 12° S. to lat. 6° N., and from long. 33° to about 16° E., where it narrows into the restricted valley by which the river makes its way through the coastal mountains to the Atlantic Ocean. The whole of this area is an elevated plain, sloping gradually from all sides toward the middle west, where the vast outlet debouches, in lat. 6° S. It presents no elevated regions worthy of mention, except about the borders. The southeast watershed is not high, nor is that on the south, which separates the Congo waters from those flowing into Lake Ngami or collected by the Zambezi. North of Lake Tanganyika the high mountains form a lofty watershed between the northeastern sources of the Congo and the sources of the Nile, and a line of hills sweeps around to the westward in the southern Sudan, and are continued to the lofty Jebel-el-Marra, in Darfur, whose slopes contribute the remotest northern waters of the Congo. The high ranges of Adamawa and the coast mountains separate its more westerly northern tributaries from the Ogowe and other coastal rivers. The mountains which separate the Congo Basin from the coast are rather the broken eroded margin of the continental plateau than true mountains, and few if any peaks exceed 5000 feet in height.

The topographical division of Sudan covers the equatorial area between the watershed of the Congo and the Sahara Desert, from the headwaters of the Bahr-el-Ghazal, a tributary of the Nile, to the mountains of the coast—that is, the drainage basins of Lake Chad and of the Niger. The basin of Lake Chad is an inclosed area almost in the centre of the continent, its southern margin being removed but a few hundred miles from the head of the Gulf of Guinea. The lake itself has no outlet, and lies about 900 feet above the sea. The eastern border of this basin is separated from the Nile waters by a line of highlands which continue northward across the desert, and which culminate in Darfur in the Marra Mountains, rising some 7000 feet above the plain, and forming a watershed for eastern Sudan. The western border of the Chad Basin is formed by rocky plateaus, which constitute a divide between this and the Niger Basin; and a uniform plain, diversified by rocky hills, stretches westward to the coast mountains. Large portions of the Chad Basin are dry and open, while other extensive areas are forested or swampy,



PHYSICAL MAP OF
AFRICA



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passing northward into desert. At the head of the Gulf of Guinea are the Kamerun Mountains, more than 13,000 feet high. Further westward along the coast of Upper Guinea there are mountains, but of no great height, the supposed "Kong Range" of old geographies having been proved non-existent. The highest peaks of the hinterland of Sierra Leone and the Mandingo Mountains do not exceed 3500 feet, except in the Peak of Komono (4600 feet). The coast of Senegal is flat; that more southerly, except in Liberia, swampy; all the rivers, and especially the Niger, form extensive deltas.

The region of arid waste lands called the Sahara lies between the Sudan on the south and the Atlas Mountains and the Egyptian coast on the north. It is a part of an arid belt extending eastward to Baluchistan, the entire area measuring about 4,000,000 square miles. Of this area at least two-thirds lies west of Suez, and is known in general as the Sahara. It is all an elevated plain, into which many valleys have been eroded by the ancient drainage systems which are now the only marked topographical features of the region. The whole area may, therefore, be divided into certain regions, limited by natural features. First, the so-called Arabian or Nubian Desert; the area between the Nile, the only living river that crosses the arid zone, and the Red Sea. This is marked in its southern portion by the continuation of the volcanic uplands of Abyssinia, which lessen in height toward the north, but border the Red Sea in a line of jagged mountains, many of which exceed 4000 feet, and one, Soturba, reaches 6900 feet. In the south is the great rift of the Wady Mahall, probably an ancient Nile channel; and in Lower Egypt are the rifts occupied by the Khargeh, Dakhel, and others, forming a line of notable oases. West of the Nile rises the desolate plateau of the Libyan Desert, which covers the whole region from central Darfur to the Mediterranean (long. 18° to 30° E.), excepting the few oases above mentioned. Its general altitude varies from about 1500 feet in the south to 500 on the Mediterranean, where it breaks down in hills. A line of elevations extending northwestward from the Marra Mountains in Darfur to the Algerian Atlas forms a sort of boundary to the Libyan Desert, and makes possible the thinly inhabited oasis regions of Tibesti and Murzuk. Further west there are wadies, or dried-up river valleys, of which one, with numerous branches, is traceable from the Tropic of Cancer north to the "shotts" or swampy lakes which occupy the large, low plain (in places below sea-level) west of the Gulf of Cabes. It is believed that within 2500 years this valley was occupied by a flowing river, but now only a few pools and springs exist through the dry season. West of this more broken region between Algeria and Lake Chad there stretches an enormous space of waterless waste land, with shifting sand dunes, broken by lines of rugged and naked elevations having a general northeast and southwest direction. This waste extends to the Atlantic coast all the way from about lat. 18° to 28° N., that is, from the hills of Senegal to the western extremity of the Atlas. The elevation of the Sahara throughout the greater part of its extent exceeds 1000 feet, diminishing gradually from the south toward the north in the Libyan Desert, and from its centre in the western half of the desert toward the Lake Chad Basin and the Niger, and toward the coast of Tunis and Tripoli. Only very small and irregular areas along the northern border are below the level of the Mediterranean.

The elevated district called the Atlas Region, with its littoral margin along the Atlantic Ocean and Mediterranean Sea, is a part of the great Alpine system of Europe, to which it is linked by the mountains of Spain and the Pyrenees. Unlike other African mountains, the Atlas have a folded structure and an Alpine character, and present many parallel zones. These ranges extend in a nearly straight line from Cape Nun, on the Atlantic, northeast to the headlands of Tunis, where they are broken through by the narrows of the Mediterranean. Along the Mediterranean coast the elevations are volcanic, and descend very abruptly. Toward the interior, irregular ranges form a long line of heights of Paleozoic rocks, which is sometimes called the Tell Atlas; but this is more prominent in Algeria than in Morocco, where the seaward side is a rough plateau. The Atlas stretches over a distance of about 1400 miles, and attains its greatest elevation in the western portion, where it rises to a height of nearly 15,000 feet.

GEOLOGY. The geological structure of Africa has been studied only in bare outline, but its broad features may be said to exhibit great simplicity and uniformity. The entire lower limb, with the Sudan and the western portion of the Sahara Desert, has a basal complex of crystalline rocks supporting sediments of Paleozoic and Mesozoic age. Strata of more recent deposition, with but one exception (Lower Egypt), occur only along the sea coast and the rivers. The greater part of the land surface, therefore, was formed in early geological times, and has remained above sea-level during succeeding periods. Owing to this uniformity, Africa cannot be divided upon a strictly geological basis into more or less distinct units; such a division, however, has been made from a combined geological and geographical standpoint, separating the entire area into three provinces. The first of these comprises South Africa, Madagascar, and a large portion of Central Africa, which at one time was united with lower India by an easterly land extension through the area now occupied by the Indian Ocean; the second includes the Sahara Desert and Egypt, and is a continuation of Arabia and Syria; the third comprises the Atlas Mountains, and is really a part of the Eurasian continent and of the great system of upheaval that is represented in Europe by the Alps and the Apennines.

The most ancient rocks found in South Africa are granites, gneisses, and schists, which lie below all fossil-bearing rocks, and may, therefore, be classed as Archæan. Above these are tilted and eroded beds of sandstones and slates, which form the rampart along the southern extremities of Cape Colony, and extend around to the west and north, spreading out over large areas in Namaqualand, Griqualand, Rhodesia, and regions to the north, and which have special economical importance, as they include within their limits the rich gold deposits of the Transvaal. These rocks are mostly of Paleozoic age. Higher up in the series are the Kimberley shales and the Karoo formation of sandstones and slates, which attain great development in British South Africa. No remains of a sea fauna have been found in the Karoo beds, but they are rich in amphibian and reptilian fossils that bear a striking similarity to the Triassic (Gondwana) life-forms of India, and also to those of Australia. They were probably deposited during the Permian and Triassic periods. Underlying them unconformably in places are the Dwyka conglomerate, a peculiar rock that often has the appearance of a volcanic breccia, and the Ecca mudstones and sandstones, consituting a group some 4000 feet in thickness. Volcanic rocks are represented by diabase and basalt, which are spread out over the surface in large sheets, being especially prominent along the eastern edge of the Drakenberg Mountains in the Transvaal. The diamond mines of South Africa are located in the vents of old volcanoes through which a basic rock (peridotite) was erupted. On the other edge of the plateau, along the sea coast, are small detached areas of sediments, more recent in origin than the foregoing.

The region of central Africa from the Sudan as far south as the Zambezi River includes large areas of which little or nothing is known. Livingstone mentioned the presence of sandstones and coal seams along the Zambezi River (lat. 16° 40′ to 15° 50′ S.), and somewhat further south crystalline rocks of Archæan type appear, as also along the shores of Lake Nyassa. The Rovuma River flows for a considerable distance (about lat. 11° S.) over sandstone beds, that rest upon granite. The sandstones are found as high as 2500 feet above sea-level, and extend from near the coast to long. 39° E. North of the Rovuma River sandstone strata, possibly of Carboniferous age, are developed on a large scale along two general lines, one extending northwest beyond the shores of Lake Tanganyika, and the other extending north to near the equator. Between the diverging areas of sandstone, crystalline rocks predominate, inclosing Lake Victoria Nyanza and reaching northward nearly to Lado on the Nile. They have been broken through and are overlaid by volcanic rocks, especially around Lake Rudolf, where volcanoes are still in eruption, and in the region east of Victoria Nyanza, where there are many inactive cones. Volcanic action has been accompanied here by great vertical displacements, to which allusion has already been made. (See also article on GREAT RIFT-VALLEY.) The west side of Central Africa, from the Kunene River to the Gulf of Guinea, has been only partly explored. Such information as is available would indicate that its structure is similar to that of the eastern coast. On the shore of Angola there is a narrow fringe of Cretaceous sandstones, and in the interior crystalline rocks, mostly granite and gneiss, and fossiliferous sandstones of undetermined age predominate. It seems probable that these formations extend into the interior toward the Congo Basin, and they may reach also northward into the Sudan. In the Congo Basin there comes into prominence a peculiar superficial deposit called "laterite," which also covers wide areas in Sudan and the Sahara Desert. It is a porous, yellow or reddish rock, formed by the disintegration and weathering of the underlying strata.

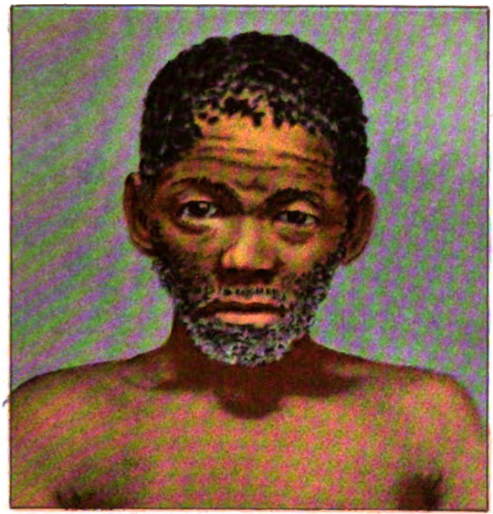
The plateau of Abyssinia has been found to consist of gneisses and granites as a basal formation, with overlying sandstone strata in nearly horizontal position. This region is especially characterized by the enormous development of volcanic rocks, which at different times have spread out over the surface. Westward, between Khartum and Fashoda on the Nile, there is a large area of Paleozoic sediments, extending on the eastern Nile bank as far south as Lado, where it sweeps around to the west. In central Sudan, crystalline rocks have been found along the Benue River and in the region between this river and the Niger. In the extreme western Sudan, sedimentary strata with Devonian and Carboniferous fossils prevail; they are also developed to a lesser extent on the Gold Coast, where they overlie gneisses and schists. The interior of Liberia and Sierra Leone is supposed to be composed largely of crystalline rocks. The Sahara Desert presents a monotonous stretch of horizontal eroded beds of Paleozoic age resting upon eruptives and gneisses. After the Carboniferous times, the whole Sahara region appears to have been elevated above sea-level and to have maintained this position until the beginning of the Cretaceous, when there was a subsidence, and the eastern part of the Sahara, including Egypt, was formed. Volcanic rocks are found in certain parts of the interior, but they are relatively unimportant. In Lower Egypt, the ridge that forms the western border of the great rift or fault of the Red Sea is made up of gneisses, granites, and basic igneous rocks, with a sedimentary cap called the "Nubian" sandstone. The last-named constitutes the banks of the Nile at Assuan, and also extends for a considerable distance into the desert region. To the north, the Nubian sandstone is succeeded by Cretaceous and Tertiary limestones.

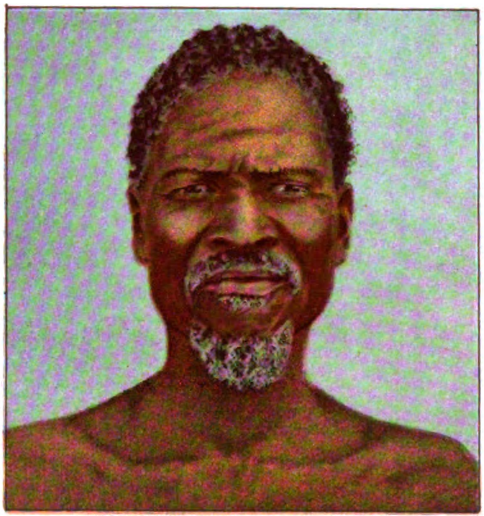
The Atlas region of Morocco, Algeria, and Tunis offers a striking contrast to the remainder of Africa, in that it is the only present representative of a mountain system formed by crustal folding. It is composed of eruptives, including trachyte and basalt, along the northern edge, with interfoliated gneisses, schists, granite, limestone, and sediments of Carboniferous, Jurassic, and Triassic age. Suess divides the region into parallel zones; the first is composed of volcanic rocks on the coast; the second consists of granite, gneiss, and schist; the third is a belt of sandstone and limestone, reaching southward into the Sahara Desert.

The continental islands, including the Canary, Madeira, and Cape Verde groups, and many isolated islands, are mostly of volcanic origin. Madagascar, however, is an exception, and represents the remnant of a larger area that once extended from southern Africa to lower India. The central part of Madagascar is made up of granites and gneisses similar in character to those found on the mainland, while the western shore is formed by Jurassic and Tertiary sediments. See also articles on countries of Africa.

HYDROGRAPHY. The great river systems of Africa, excepting the Niger, have their sources in the mountains of the south and southeastern parts. At the Gulf of Suez a line of highlands crosses to Africa from Syria, which follows the coast line of the Red Sea to its southern extremity, then bends to the south, passes the equator, and joins the broad plateaus that extend over South Africa. As there is no prominent interior mountain range, this long line of coastal highlands forms the most important water-parting of the continent. Within its bounds are the upper courses of the Nile, Congo, and Zambezi, as well as of the Orange and of most of the smaller streams. The Nile, Niger and Congo

DARK RACES OF AFRICA


BUSHMAN TYPE SOUTH AFRICA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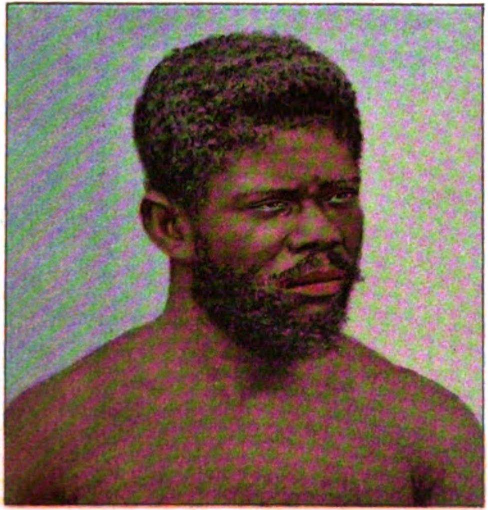
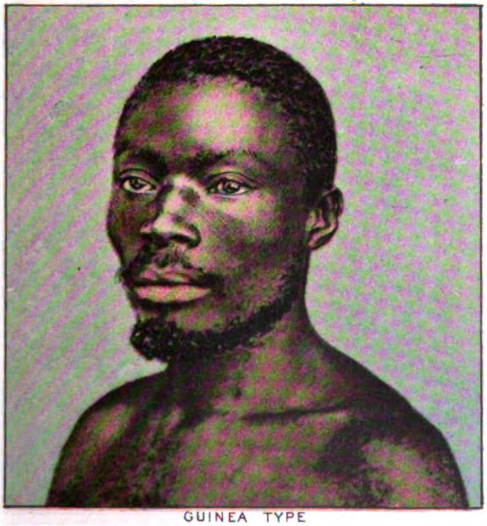

CONGO TYPE

ZULU TYPE SOUTH AFRICA


GUINEA TYPE

ZANZIBAR TYPE EAST AFRICA

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rivers have their origin on the interior slopes of the highlands, and therefore discharge into the Atlantic Ocean, while the Zambezi drainage basin, lying largely on the outer slopes, falls off toward the Indian Ocean. The longest river system is that of the Nile, which rises in the lake region of Equatorial Africa and flows northward through the mountainous divide to the plateau region of eastern Sudan, where it receives an important affluent from the west in the Bahr-el-Ghazal, and is joined further north by the Bahr-el-Azrek (Blue Nile) and by the Atbara, both from the plateau of Abyssinia. In the middle portion of its course the Nile practically completes its vertical descent by numerous cataracts, after which it flows through a valley that is but little above the level of the sea. The drainage basin of the Nile includes an area of about 1,500,000 square miles. Next to the Nile in length and superior to it and to all other rivers of the world excepting the Amazon in volume is the Congo, which rises in the equatorial lake region and drains an area probably exceeding that of the Nile. The Congo flows northwest, then describes a great arc, with its chord formed by the equator, and finally turns southwest, and pierces the coastal barrier of lower Guinea to enter the Atlantic. The tributaries of the Congo include many great rivers, such as the Ubangi, Kassai, and Kuango. South of the Congo are the drainage basins of the Zambezi and Orange rivers, which extend nearly across the lower limb of the continent, and have an eastward and westward slope respectively. The great land-mass composing the western limb of the continent is poorly watered, the Niger being the only river of first importance lying wholly within the area. This river drains the northern slopes of the coastal highlands of Guinea, through which it breaks after being joined by an important tributary from the east, the Benue, and enters the Gulf of Guinea. Of lesser rivers may be mentioned the Limpopo, Rovuma, Sabi, Tana, and Jub, which enter the Indian Ocean, and the Kunene, Kuanza, Ogowe, Volta, Gambia, Senegal, and Draa on the western coast. Owing to the mountainous barrier through which they must pierce to reach the sea, the smaller rivers of Africa generally are unnavigable in their lower courses.

Between the drainage basins of the Nile, Niger, and Congo, and west of the north and south range of highlands of Sudan, is the interior basin of Lake Chad. This lake is fed chiefly by the Shari and Waube, and is subject to great variations of level. It is at the present time a shallow body of fresh water, with an area that is said to range at various times from 10,000 to 20,000 square miles. This phenomenon of sudden variations in level and consequently in area is peculiar to all the rivers and lakes of Africa within the equatorial regions, and is due to the seasonal distribution of rainfall. Between Abyssinia and the Zambezi River and within the bounds of the north and south highland region there is another inland drainage basin with several large lakes, which together constitute one of the most striking physiographical features of Africa. Apparently the lakes lie along a line of rifts or fissures which have been formed by sudden displacements of the earth's crust. Some of the lakes are, Margherita, Abaya, Stephanie, Rudolf, Manyara, Natron, Baringo, Eyassi, and Leopold (Rikwa), all but Rudolf being small bodies of water. The largest lakes (Victoria, Albert, Albert Edward, Kivu, Tanganyika, and Nyassa) drain into the Nile, the Congo, or the Zambezi, and are fresh water bodies. Victoria, Tanganyika, and Nyassa rival in extent the great lakes of North America. For further details, see articles on CONGO, VICTORIA NYANZA, etc.

CLIMATE. Of all the great land divisions of the globe, Africa is characterized by the greatest uniformity of climate. It stretches into both the north temperate and south temperate zones, but the greater part of its area is included within the tropics; there is consequently a successive decrease of average annual heat northward and southward of the equatorial belt, but the regularity of the decrease is modified by certain other factors, so that the region of greatest average heat for the year is located not at the equator but considerably north of it, between the parallels of 10° and 20°. These modifying factors are mainly the direction of the winds and the distribution of the mountains. It is, of course, cooler here in certain seasons than in others; but the average temperature of any given season shows little fluctuation. In summer the isotherm of 80° F. incloses the whole of the Sahara Desert, and over a considerable portion of this area the average summer temperature is 97° or more. This region of extreme heat, which is the largest in the world, may be delimited by a line drawn from Khartum west to Timbuktu, thence north to El-Golea in the Algerian Sahara, thence southeast to Murzuk and thence to Berber on the Nile. The mountain regions of Algeria and Morocco, and parts of British South Africa and of German South-West Africa have a subtropical or temperate climate. Throughout a large portion of Africa, especially in the mountains of the east, and in the Sahara and Kalahari deserts, the temperature varies widely between summer and winter and between day and night, as is characteristic of all desert regions. (See DESERT.) In the Kalahari Desert the extreme seasonal fluctuation reaches 113°, and in the Sahara Desert the temperature during the night often approaches the freezing point. In general, the western coast of Africa is cooler than the eastern coast, owing to the conditions heretofore stated, and to the influence of the drift northward along that coast (south of the equator) of the cool water from the Antarctic Ocean. (See article on CLIMATE.) *Winds.*—Trade winds are characteristic of nearly the whole continent. The Sahara Desert is a region of high barometric pressure during the winter months, thus causing outward blowing winds, while in the summer season the pressure is lowered, and there is an indraught from the surrounding territory. In the western part of the Sahara Desert and Sudan, north and northeast winds prevail during the greater part of the year, alternating with northwest and west winds for a few months in winter. The eastern Sahara region and Egypt have prevailing north and northeast winds. A devastating wind called the "khamsin" blows from the southeast across this region at times, carrying dust and sand and causing sudden rises of temperature. A similar dust wind, but usually cooler, blows from the interior of the Sahara over Senegambia and Upper Guinea, and is called the "harmattan." During the summer, in the lower limb of Africa, an area of low pressure occurs in the interior, and the prevailing winds are from the east and southeast, on the eastern border, and south and southwest on the western. In winter there is a shorter period in which the winds blow outwardly. (See article on WIND.) *Rainfall.*— The principal factors governing rainfall are evaporation, direction of winds, and distribution of mountains. A combination of these factors most favorable to a large rainfall is found on the west coast of Africa near the equator. Here the humid atmosphere from the Atlantic is carried landward by the winds and, becoming cooler, deposits the greater part of its moisture before passing the highland region. The maximum limit of precipitation is probably attained in Kamerun, where the total rainfall in the year may exceed 350 inches, while the Niger Delta and the coasts of Sierra Leone and Liberia also are excessively humid. On the east equatorial coast the winds from the Indian Ocean deliver considerable moisture, but not in such abundance as on the west coast. As they pass into the interior, the winds from both the Atlantic and Indian oceans are deprived of their humidity, especially in the mountains, which act as precipitating agents. Equatorial Africa, as a whole, is thus characterized by a heavy rainfall. North and south of this region, however, the conditions exhibit a striking contrast. In the north is the Sahara Desert, the largest arid region in the world, where the prevailing winds are from the northeast and are hot and dry, while the humidity of the southerly winds that may penetrate into the interior is diminished by the heat, and seldom falls as rain. A second arid region, the Kalahari Desert, is found in the southern limb of the continent, between the Zambezi and Orange rivers and the eastern and western coastal highlands. It has a small spasmodic rainfall, which is usually insufficient to support a constant growth of vegetation. The Mediterranean coast region and the extreme southern extension have a dry climate that is tempered by rains during certain seasons. Besides the continental distribution of rainfall, there is a seasonal variation in the amount received in different latitudes. In the regions near the equator rain may fall during every month of the year, but the periods of greatest precipitation occur when the sun is nearly vertical, in spring and fall. Away from the equator there is generally but one wet season. See articles on countries of Africa.

FLORA. The vegetation of Africa is very diversified on account of the well-marked topographic districts and the varied climatic conditions. The three zones of tropical, north temperate, and south temperate climate have their peculiar types of vegetation, the distribution of which in each zone is determined by the immediate physiographic features. Forest, steppe, savanna, and desert floras are found in each zone. The flora of the Mediterranean slope of the northern temperate zone has a general resemblance to that of southern Europe, with forests of oak and of smaller trees, as olives and figs, with also the vine and the same cereal grains. The desert regions (typified by the Sahara in the north temperate zone and the Kalahari Desert in Bechuanaland of the south temperate zone) support a scant xerophytic vegetation, which, contrasted with the flora of the North American deserts, has for its most prominent types quite leafless, thorny and fleshy euphorbias and acacias instead of cactuses. In the Sahara Desert the date palm grows often in extensive groves in the oases, and its wide distribution is probably due in large part to the dispersion of its seeds by the nomadic tribes, for whom its fruit serves as an important article of food. Bordering the Sahara and the Kalahari deserts are extensive semi-arid steppe or prairie regions, where the slight rainfall permits of the existence of a somewhat more varied flora, which combines certain of the desert and forest types. The steppe region of the southern temperate zone has, by reason of its isolation, developed a flora peculiarly its own, which is characterized both by the abundant presence of many members of the heath family (which often grow to a height exceeding 10 feet), and also by the general brilliancy of color of the flowering plants.

Those portions of Africa which have a moist climate are divisible into the savanna and forest regions. The forests are found mostly in the equatorial districts, where they are of enormous extent. Here the trees grow to great heights (often 200 feet), and, being close together, support numbers of parasitic vines, forming over vast areas a dense, tangled covering of foliage, through which the direct rays of the sun seldom penetrate. The savanna districts are uniform plains of both high and low land. On the damp lowlands, reeds, especially the papyrus, abound (as, for example, in the marshy regions of the Nile and Congo valleys); on the drier high grounds good pasture grass with euphorbias forms the dominant vegetation, together with forest growths in the river valleys. The more important trees are the baobab (*Adansonia*) and the wine and oil palms (*Raphia* and *Elæis*). In conclusion, it may be stated that the flora of Africa is characterized by the extensive development of acacias and euphorbias over the entire continent, with the date palm in the northern (particularly in the arid) regions, and the papyrus in the marshes. See DISTRIBUTION OF PLANTS.

FAUNA. The fauna of Africa is remarkable for its homogeneity, for the continental range of a great number of its groups and species, due to the absence of extensive mountain barriers, and for its remarkable alliance with the faunæ of the other divisions of the southern hemisphere. Africa — apart from the northwestern corner (the Atlas Mountains, in which live the aoudad and certain other European forms)—is now regarded as forming, together with Arabia and Palestine, a single zoögeographical prime division called Ethiopian. Surveying its principal groups of animals, it is seen to be characterized in respect to the mammals by the preponderance of hoofed animals and the great size of many, such as the elephant, hippopotamus, and rhinoceros, by the originally vast numbers of gregarious grazers, and by their distinctive forms. Thus, there are no true oxen, but a buffalo is abundant; no camels nor llamas; no sheep nor goats; no deer (except the aberrant chevrotain) nor true swine. But it has exclusively several species of the horse family, the zebra, quagga, and wild ass: a giraffe, once ranging all the southern plains, and the okapi (q.v.); the tribe of hyraxes, and almost a hundred kinds of antelopes and gazelles, few of which range outside of Africa and Arabia. Of apes, the chimpanzee and gorilla belong to the equatorial forests alone; but more widely distributed, though exclusively African, are the baboons, various kinds of monkeys, and nearly all the lemuroids. Among the carnivora, bears, wolves, and foxes are wholly absent, and several feline, viverrine, and canine forms are peculiar, although the characteristic lion and leopard are not restricted to Africa. The lesser mammals are mainly the same as or allied to southern Asiatic and Oriental forms. Resident birds display similar unlikeness to Europe and Asia, and suggestive resemblances to those of the Australian and Neotropical regions. Thus, the ostrich, so widespread and characteristic of Africa, is unknown elsewhere, but its allies are the extinct and modern ratite birds of the Australasian archipelago and the rheas of Argentina. Africa is rich in reptiles, but few are peculiar, chiefly terrestrial venomous snakes and the chæmasaurid lizards; and the affinities of this group, as of the fishes, are Oriental, though some of the fishes are remarkably related to ancient American families. Similar remarks apply to the invertebrates, where many genera even are the same as those of either Australia, the Malayan region, or America. For particulars as to the various faunal sub-regions, Madagascaran, West-coast, etc., see DISTRIBUTION OF ANIMALS.

POPULATION. Recent authorities roughly estimate the population of Africa at about 140,000,000, or 12.4 to the square mile, a density slight when compared with that of Europe, but much greater than that of the American continent. According to the nature of the soil and of the climate, the population is distributed very unevenly over the surface, being very dense in the Nile delta and massed somewhat densely in the upper Nile valley, and generally throughout the Sudan, less thickly over the southern plateau, and very thinly in the outlying regions of Morocco and Tripoli; while large tracts, especially in the western Sahara and in the Libyan and Kalahari wastes, are absolutely uninhabited. Of the inhabitants of Africa, only a small portion are recent immigrants from Europe, settled chiefly in the extreme north (Algeria) and in the extreme south (Cape Colony, Natal, and the Boer territories).

ETHNOLOGY. The yellow, the brown, and the red varieties of the human genus have no representatives in Africa, with the exception of some of the Polynesian tribes in Madagascar and the intrusions of eastern Asiatics in recent times. The 140,000,000 inhabitants of the continent represent the white and the black varieties of man, or mixtures of these. Northern and northeastern Africa have been occupied in historic times by white races, while equatorial and southern Africa were the home of black races; but the white Africans have from remote antiquity forced themselves into the black man's territory, and negro blood has mixed with that of Hamite and Semite across the Sahara; hence, especially on the border line, the ethnic stocks are intermingled.

Various schemes of classification have been proposed for the people of Africa, the latest of which are by Deniker and Keane.

Deniker's scheme (*Races of Man; an Outline of Anthropology and Ethnology*, London, 1900) is as follows:

I. Arabo-Berbers, or Semito-Hamites — (1) Jjerba subrace; (2) Elles type; (3) Dolichocephalic Berber subrace; (4) Jerid or Oasis type.

II. Ethiopians, or Kushito-Hamites, sometimes called Nuba, or Nubians.

III. Fulah-Zandeh group. Mixture of Ethiopians and Nigritians or Sudanese Negroes.

IV. Nigritians, (1) eastern Sudan, or Nilotic Negroes; (2) Nigritians of central Sudan; (3) Nigritians of western Sudan and Senegal—Haussas, Mandes or Mandingans, Toucouleurs or Torodos, Yolofs of Senegal; (4) Littoral Nigritians or Guineans—Krus, Agnis, Tshis, Ewes; (5) Yorubas.

V. Negrillos.

VI. Bantus. In Central and Southern Africa; divided into Western, Eastern, and Southern Bantus.

VII. Bushmen-Hottentots.

VIII. Hovas, Malagasies, and Sakalavas of Madagascar.

Keane's analysis of African peoples is given in his *Ethnology* and in Stanford's *Africa* (see bibliography at end of article). In the latter the classification is by regions, as follows:

I. *Atlas Region.* Stone Age men; peoples akin to Iberians and Silurians, artificers of the monolithic monuments; Berber Hamites; Phœnician Semites; Romans; Teutonic Vandals; Semitic Arabs; Negroes; Jews and modern intrusions; and Pygmies in the Atlas Mountains.

II. *Tripolitana.* Berbers or Libyans in many communities; Arabs; Negroes, chiefly slaves. The Phœnicians of Herodotus are replaced by Turks, Jews, Maltese, Italians, etc.

III. *Sahara.* Arabs, pure and mixed in many tribes and confederacies; Tuaregs, pure and mixed; Tibus; Negroes from the south.

IV. *Sudan.* Arabs; Hamites (Tibus, Tuaregs, and Fulahs); Negroes, beginning at the west coast: (1) Senegal to Sierra Leone—Wolofs, Sereres, Toucouleurs, Mandingans, Felups, etc.; (2) Sierra Leone—Temnis, Colonials, etc.; (3) Liberia; (4) Ivory Coast; (5) Gold Coast—Tshis, Ga; (6) Slave Coast—Ewes, Yorubas; (7) Upper and Middle Niger—Bambaras, Songhays, Haussas, etc.; (8) Benue Basin; (9) Lower Niger; (10) Niger Bend; (11) Chad Basin; (12) Wadai; (13) Darfur and Kordofan—Nubas and Nubian family of languages; (14) Upper Nile basin—Madis, Dinkas, Shilluks, Mundus, Bongas, etc.; (15) Welle basin—Mombuttus, Niam-Niams, Akka dwarfs, etc.

V. *Italian and Northeast Africa.* Somali Hamites; Galla Hamites; Afar (Danakil) Hamites; Abyssinian (Agau) Hamites; Semitized Hamites; Himyaritic (Abyssinian) Semites; Tigré, Amharas, Shoas; Arab (Nomad) Semites; Negroes and Bantus.

VI. *Nubia and Egypt.* (1) Nuba group—Nubas proper; Nilotic Nubas (Nubians, Barabra); (2) Beja group; (3) Egyptian group—Fellahin, Copts; (4) Arab group—(a) Settled; (b) Nomad and Semi-Nomad.

VII. *The Kameruns.* Bantu tribes, indigenous and intruders.

VIII. *French Equatorial Africa.* Bantu tribes, Mpongwe and others.

IX. *Congo Free State.* Bantu, chiefly. Names commencing with A-, Ba-, Ma-, Wa-, etc.

X. *Portuguese West Africa.* Angolan tribes chiefly. (1) Ba-Congo group; (2) A-Bundo group; (3) Aboriginal group.

XI. *German Southwest Africa.* (1) Ovampo groups; (2) Ova-Herero groups (Damara lowlands); (3) Nama groups (Namaqualand); full-blood Hottentots, Orlams (Hottentots from Cape Colony), Bastaards (Dutch Hottentot half-breeds from the Cape).

XII. *Cape Colony.* (1) San (Bushmen); (2) Hottentots; (3) Basutos; (4) Kaffirs.

XIII. *Southeast Africa.* Bechuanas; many tribes, whose names begin with Ba-.

XIV. *Zambezia, south and north.* (1) Bechuana natives; (2) in North Zambezia the greatest confusion of natives.

XV. *Portuguese East Africa.* (1) Zulus; (2) Tonga tribes; (3) mixed tribes; (4) Banyans or Hindu traders in seaports.

XVI. *German East Africa.* Bantus, pressed on by Arabs, Zulus, Nilotic Negroes. Many tribes whose names begin with Ma- or Wa-.

XVII. *British East Africa.* Ethnic diversity, every race in Africa except Bushmen-Hottentots. (1) Bantus; (2) Marai; (3) Somali; (4) Gallas; (5) Bantu Gallas (Wa-Huma); (6) Negroes; (7) Negritos.

XVIII. *Madagascar.* Malayo-African mixed peoples, all speaking a Malayo-Polynesian language. (1) Hovas, in the centre; (2) Betsimisarakas, on the east; (3) Sakalavas, on the west.

The Northern Africans are Hamitic, and were preceded (1) by Stone Age peoples; (2) by the kindred of Iberians, Silurians, and other tribes of Southern and Western Europe. The monolith builders apparently merged into the Berber Hamite intruders, who, in turn, were encroached upon by Phœnician Semites; then followed Romans and Teutonic Vandals, though the chief ethnic element continued Berber until the coming of the Arabs (100-200 A.D.) and the irruption of the Moslems (from 639 A.D.). The Arabs are now in the ascendency, but Hamitic tribes continue in the uplands (Keane, 1895).

There are among the African peoples examples of the lightest and the darkest races. There are also examples of the smallest and the largest of mankind, as the measurements in metric standard from Deniker will show: Akka, 1.378 meters; Bushmen of Kalahari, 1.529; Mzabite Berber, 1.620; Batekes of the Congo, 1.641; Algerian Arabs, 1.656; Berbers of Tunis, 1.663; Abyssinians, 1.669; Danakils, 1.670; Kabyles, 1.677; Bechuanas, 1.684; Mandingo, 1.700; Kaffirs, 1.715; Somali, 1.723; Wolof, 1.730 (many are over six feet); Fulah, 1.741. Compare with these the Æta of the Philippines, 1.465; Eskimo, 1.575; Lapps, 1.529; Cheyennes, 1.745; Sikhs, 1.709; and Marquesas Islanders, 1.743. The range of cranial index is quite as wide. Among the Congo tribes the index is 72°.5; the Fijian Negroes have an index of 67°.2; the Sara of the Chad Basin have an index of 82°.4; but many peoples in Oceanica, America, Asia, and Europe range between this ratio and 88°.7.

RELIGIONS. Fifty-eight per cent. of the population, according to the estimate of H. P. Beach, are devotees of the native religions, which are characterized by these features: (1) Belief in some sort of a supreme God, who, in a vaguely conceived way, creates and rules all. (2) Worship of ancestors. It is not so elaborately worked out as in China, but still it underlies the West African scenes of dreadful slaughter of the slaves and wives of his predecessor, ordered when a chief succeeds to office, for by such bloodshed he pays respect to the deceased. (3) Fetishism, with the accompaniment of a priest or sorcerer. (4) Superstition of the grossest and most degrading kind. The heathen African is the slave of this low type of religion, and, in consequence, his life is full of terrors, as it is to the interest of the fetish doctors to work upon these fears. Idolatry is not found in central Africa at all, and nowhere is it so elaborated as in India. *Imported Religions.*—(1) Mohammedanism. Of the religions imported into the continent, by far the most important is Mohammedanism, the faith of 30 per cent. of the population. It came thither in the seventh century and overran all north Africa in a hundred years, so completely overturning the Christian churches which had been planted there that they have never been revived. Mohammedanism retains its conquests in Egypt, Barca, Tripoli, Algeria, and Morocco, and it is to-day one of the greatest missionary religions. It presents a one-sentence creed: "There is but one God and Mohammed is his prophet," and has the simplest methods. The missionary is unpaid and usually a native. There are no mission boards, or expenses for salaries and printing. There is usually no special training, although in Cairo there is a Mohammedan university, attended by thousands of students, and from this many of the missionaries go forth. They have been remarkably successful in spreading their faith among heathen populations in Central Africa. In this way Mohammedanism has exerted an influence which counteracts the native religions, and so improves the condition of the peoples it reaches. (2) Christianity: (*a*) Copts, the descendants of those original Christians who, in the fifth century, adopted the theory that in Jesus the human and divine make one composite nature (monophysitism), and so are reckoned among Christian heretics. They are found in Egypt and number about three-quarters of a million. (*b*) Abyssinian Christians, who trace their faith back to the Coptic missionaries of the fourth century, but present a curious mixture of Christianity and Judaism. (*c*) Roman Catholics: The first missionaries of this faith to penetrate the Dark Continent were Jesuits, and they began work in the middle of the sixteenth century. Indeed, St. Francis Xavier came to Mozambique as early as 1541, but he did not stay more than six months. The result of the work, carried on continuously ever since, has been that now one and two-fifths per cent. of the population are Roman Catholics, living in all parts of the continent. Livingstone bore testimony to the value of the work of these missionaries. (*d*) Protestants: The first who came to Africa were Moravians. This was in 1792. Since then all branches of Protestantism have labored there, and their converts now number one and nine-tenths per cent. of the population, and they are found in every part. Roman Catholics and Protestants, especially the latter, carry on missionary work among the Coptic and Abyssinian Christians. South Africa is to a considerable extent a Christian country of the modern civilized type. (3) Judaism: About three-tenths of one per cent. of the population of Africa are Jews.

SOCIAL CONDITIONS. Slavery is still "the open sore of Africa," as Livingstone said, and nowhere is it more cruel, bloodthirsty, and destructive. The ivory trade is a constant source of trouble, setting tribe against tribe in war. Polygamy is widespread. The tribal government, the absence of central authority, the usual conditions of savage life, in bondage of superstition and terrors of every kind, these disturb life over great stretches of territory. Yet it is the testimony of travelers that peace and a certain kind of prosperity are found in many villages in the very heart of the land. Consult: F. P. Noble, *The Redemption of Africa* (New York, 1899, 2 volumes); A. P. Atterbury, *Islam in Africa* (New York, 1899); H. P. Beach, *Geography of Protestant Missions* (New York, 1901).

HISTORY.

Early History and Exploration. In the earliest historic times, when civilization centred around the Mediterranean, Libya, as Africa was known to the ancients, was one of the three great divisions of the earth, of which Europe and Asia were the other two. The details of its history are to be found in the history of Egypt, still the earliest recorded civilization, and of the other states of northern Africa, as well as of the Roman Empire, which absorbed them all. The brown-hued Berbers seem to have been the fundamental race stock throughout northern Africa, with perhaps Aryan and Semitic infusions, due to the contact of Egypt with Asia and Europe. Whether the Hamitic peoples of Africa were or were not autochthonous is a problem for the settlement of which no sufficient data exist. The knowledge possessed by the ancients of the continent as a whole, so far as we have accounts of it, can be briefly stated. The rulers of Egypt, as subsequently those of Carthage, attempted to extend their influence toward the south and west; but the physical and climatic conditions and the savage tribes encountered presented an effective bar to extended progress at that time. An inscription assigned to the period of the Eleventh (Theban) Dynasty tells of a voyage made by command of one of the rulers of that dynasty to the land of Punt, probably Somaliland. Recent discoveries also seem to increase the credibility of traditions which assigned the biblical lands of Ophir to the eastern coast of Africa. About thirty centuries ago the enterprising Phœnicians planted Utica (c.1100 B.C.), Carthage (826 B.C.), and other lesser colonies along the Mediterranean coast, and Greek colonies were founded in Egypt, in Cyrenaica, and just east of Carthage, during the period of Greek colonization, which began in the eighth century B.C.

The known explorations of the Dark Continent may be said to begin with the famous voyage made by Phœnicians about 600 B.C., an account of which is preserved by Herodotus (iv. 42). There are no sufficient reasons for doubting the general accuracy of the account, which describes the voyage as made by command of Necho, King of Egypt, who had just completed a canal from the Nile to the Red Sea. The expedition sailed down the Red Sea and along the coast of Africa, until the sun for many weeks "rose on their right hand." After a long absence the explorers returned to Egypt through the Pillars of Hercules, so that they must have circumnavigated the continent. A hundred years later, also according to Herodotus (iv. 43), a Persian of noble birth, Sataspes, started, with a Carthaginian crew, down the west coast of Africa, but was compelled to turn back. It is doubtful if he went far beyond the Phœnician settlements, which, beginning at Gades, just without the Pillars of Hercules, already extended well down the coast of Morocco, along which Hanno, about 480 B.C., planted a series of colonies. The "Islands of the Blessed" also (the Madeira and Canary islands) were probably within the scope of the sea-going trade of the Phœnicians and Carthaginians. Carthaginian traders trafficked by sea with the Gold Coast, and by land along the caravan routes which communicated with the flourishing regions of Upper Egypt and the Niger. It is probable that almost contemporaneously with the Phœnician settlements in Northern Africa, Arabs entered the country south of the Zambezi, and, going inland, found and worked the gold mines which have been recently rediscovered. The Greeks began to colonize Northern Africa in the seventh century B.C. After the conquest and destruction of Carthage by Rome (146 B.C.), all Northern Africa was gradually drawn into the growing empire; but Rome's interest lay in the known and organized regions, upon which she strengthened the hold of civilization, ignoring all that lay beyond her well-defined boundaries, a policy which was accentuated as the empire tended toward decay.

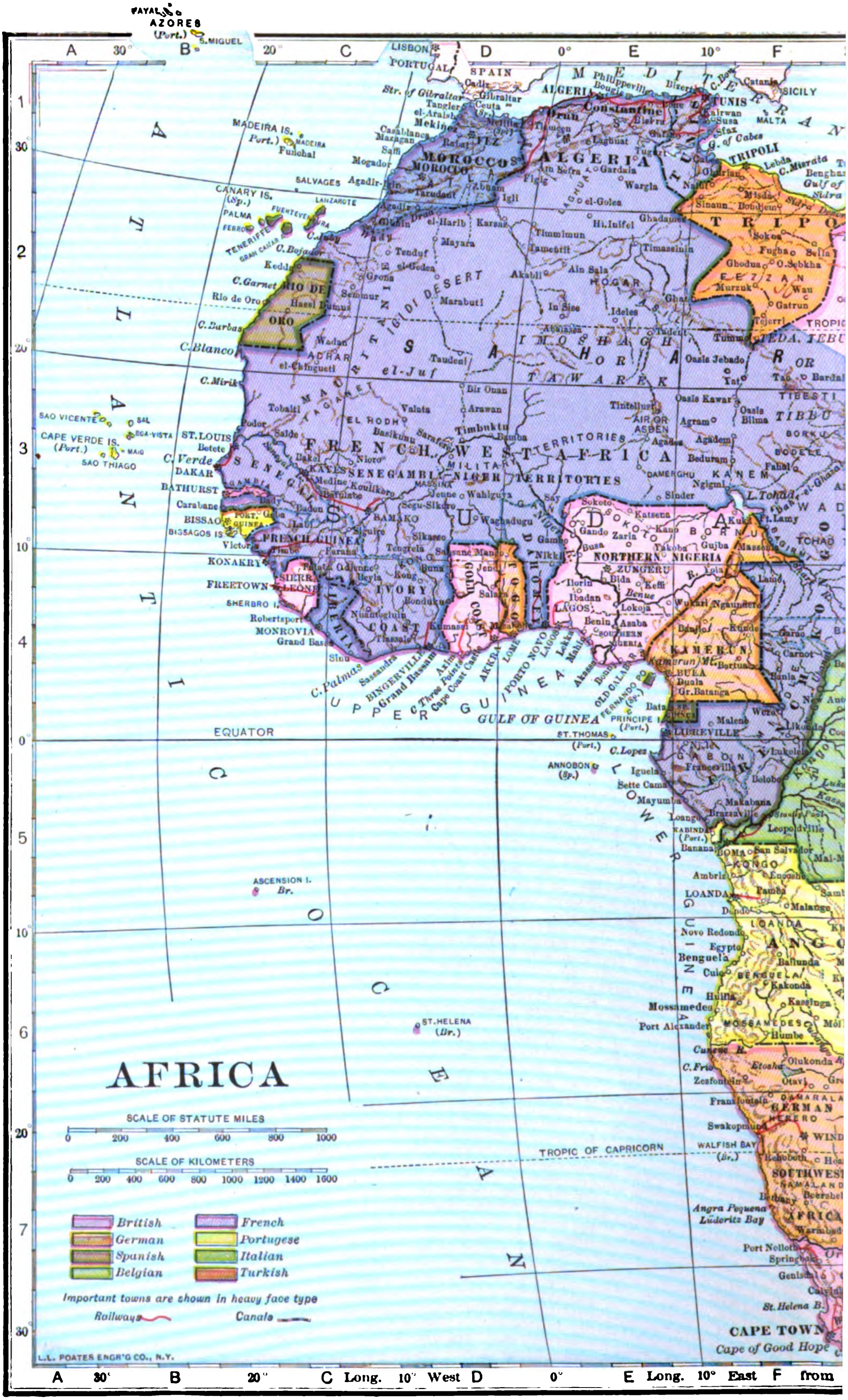
Christianity was introduced into Africa in the earliest days; the North African Church was a recognized division of the Christian Church in the second century, and when a synod of this Church was held in 258 it was attended by 87 bishops. Its chief city was Carthage. Three names in this Church are prominent: Tertullian (third century), the first to employ the Latin language in the service of Christianity; Cyprian (third century), Bishop of Carthage, and one of the great ecclesiastics of the early Church; and Augustine (fifth century), Bishop of Hippo, the greatest of the Latin fathers. The earliest translation of the Bible into Latin was made in North Africa, and it was the battle ground of the famous fights with heretics and schismatics, such as Donatists, Pelagians, and Montanists. But the Church was destined to have a short life. Undermined by formalism and apathy. it fell beneath the Mohammedan onslaught in the seventh century. During the Germanic invasions the Vandals grasped the African provinces, and in the early mediæval period much that had been known to Ptolemy and the geographers who preceded him was forgotten. The maps of Ptolemy, representing the knowledge of the second Christian century, indicate the course and sources of the Nile and the mountains of West Central Africa more accurately than they were again shown on maps before the middle of the nineteenth century. What Europe was forgetting, the Arabs, in the advance of the Mohammedan power, rediscovered. From Arabia the new faith spread rapidly westward along the southern shores of the Mediterranean and inland across the desert. It took such deep root in Northern Africa that the Christian religion, which in many places was then well established, has never been able to regain a real foothold among the native races.

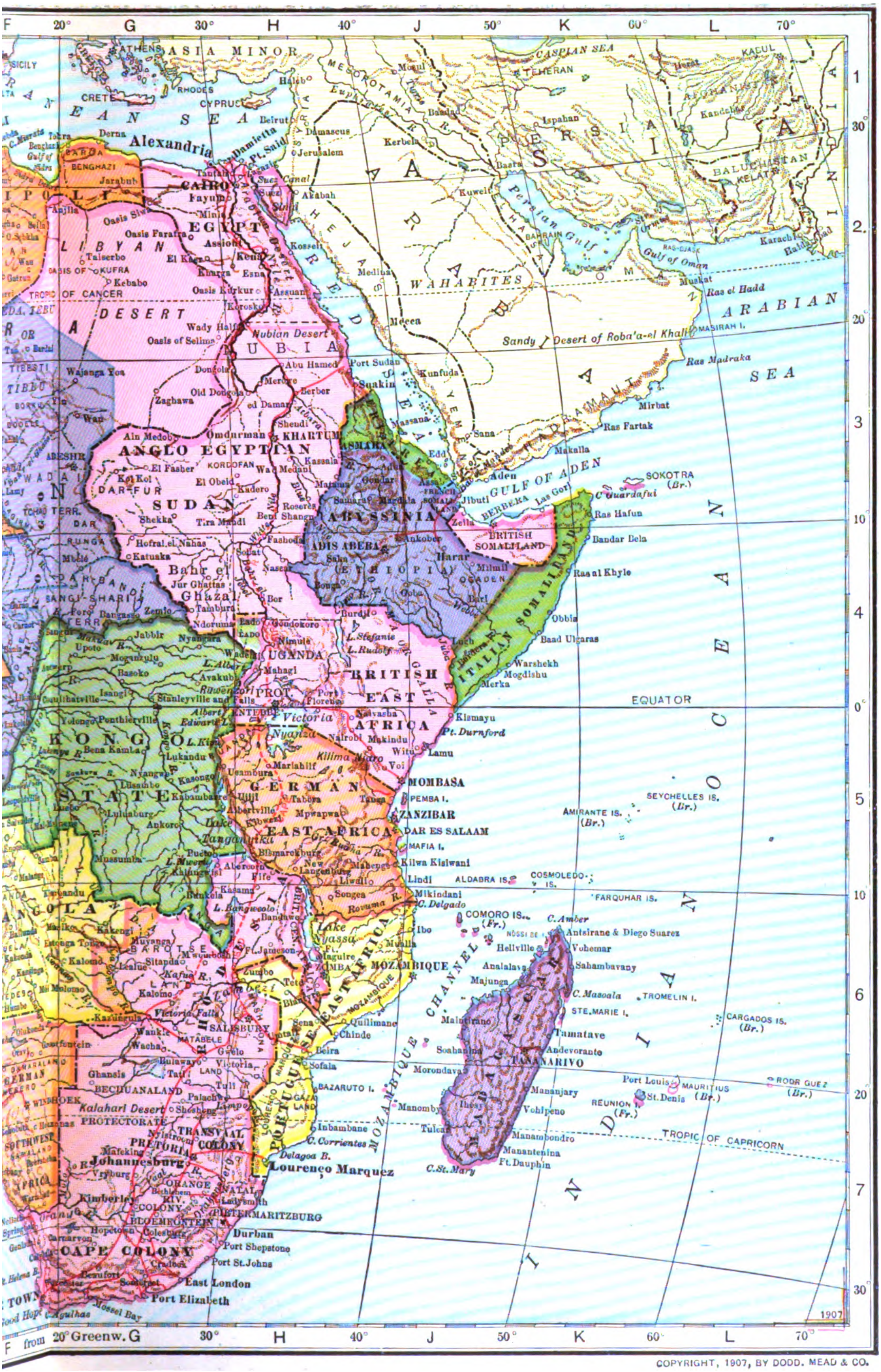
Northern Africa became a battle ground during the later Crusades and all the succeeding struggles on the Mediterranean between Cross and Crescent, and was the scene of changes and strife among rival Mohammedan dynasties; but ignorance of the rest of the continent only deepened with the centuries, except among the Arabs, who occasionally pushed their expeditions southward. If traditions may be believed, Norman vessels from Dieppe visited the Gold Coast as early as 1364, and in 1413 the Normans built a fort at Elmina. There is neither inherent improbability in this story nor satisfactory evidence to prove it, but it is probable that Norman voyagers found their way to the West African coast at a very early period. In 1402 Jean de Béthencourt sailed from La Rochelle and established a settlement on Lanzarote, one of the Canary Islands. During the next three years he extended his sway over the natives of the neighboring islands. Although his expedition is sometimes spoken of as the beginning of modern African discovery, the accounts of it show conclusively that the islands were already comparatively well known. Indeed, Béthencourt seems to have started with some sort of a grant from the King of Castile. Long before, in 1344, the Pope had granted the islands to a scion of the royal house of Castile, Don Luis de la Cerda, who had taken the title of Prince of Fortune, i.e., of the Fortunate Islands. This same year, 1344, is given as the date for the discovery of Madeira. In that year, so the tale goes, a young Englishman, Robert Machin, eloped with Anne d'Arfet, or Dorset, a woman of noble birth, and sailed away with her for France, but contrary winds carried them to the island of Madeira. There the lovers died; but one of the company returned to Portugal, and the report of his adventures served to guide the captains of Prince Henry, who rediscovered the island in 1419.

The real opening of Africa to the knowledge of the modern world began with Prince Henry of Portugal (q.v.), called the Navigator. In 1415 he participated in the victorious campaign of Portugal against the Moorish citadel of Ceuta and his interest was awakened by the enigma of the unknown continent. On his return he devoted himself to the task of sending expedition after expedition down the African coast to determine the extent of the continent, and to find, if possible, a way to the east around it. These expeditions crept further and further southward. In 1434 Gil Eannes passed beyond Cape Bojador, the "bulging cape," off which the Atlantic currents ran so strong as to bar all previous attempts at progress. In 1441-42 Antão Gonçalves and Nuño Tristão passed Cape Blanco and reached the Rio d'Ouro whence they brought back ten negro slaves and some gold dust—and the demoralizing trade which was to characterize West Africa for nearly four centuries was fairly begun. In 1445 an exploring party started from the mouth of the Rio d'Ouro and spent seven months in the interior. In the same year Diniz Dias passed the mouth of the Senegal, discovered Cape Verde, and returned to Portugal with four negroes taken from their own country, previous importations having been secured by exchange with the Moors. The next year Nuño Tristão reached the Gambia, where he was killed, with most of his followers, by the natives. Ten years later, 1455 and 1456, Cada Mosto (q.v.) explored the river and discovered the Cape Verde Islands. In 1448 the Portuguese built a fort on the Bay of Arguin, south of Cape Blanco, and soon after formed a company for carrying on trade in slaves and gold with the Guinea Coast. The impulse given to exploration by Prince Henry continued after his death, which occurred in 1460. Pedro de Cintra, in 1462, added the coast as far as Sierra Leone and Cape Mesurado to the Portuguese claims. In 1471 Santarem and Escobar carried the Portuguese flag across the equator. Commerce, meanwhile, was familiarizing pilots and the makers of sailing charts with the details of the West African Coast. In 1482 Diogo Cão passed the Congo and heard from the natives tales which seemed to confirm the old story of Prester John (q.v.), a Christian king ruling somewhere beyond the wall of Mohammedanism with which Europe was surrounded. It has been supposed by some that the King of Abyssinia was the subject of this legend. The Portuguese king determined to communicate with this unknown Christian brother, and in July, 1487, sent Bartholomeu Dias (q.v.) with two ships of some fifty tons and a smaller tender to carry his message. From the Congo, Dias beat down to Cape Voltas, near the mouth of the Orange River. Thence he was driven by storm southward for thirteen days, after which he steered north and east in the hope of regaining land. He sighted the southern coast of Africa, near the Gouritz River, at Vleesch Bay. Keeping on toward the east, he landed on an island in Algoa Bay, still known as Santa Cruz, or St. Croix, from the cross which he set up there. When he reached the mouth of the Great Fish River, long the boundary of Cape Colony, the patience of his crews gave out and they forced him to put about for home. On the return journey he sighted, first of modern sailors, the great landmark which has appropriated the generic name of The Cape. Dias christened it the Stormy Cape (Cabo Tormentoso), but on his return in December, 1488, the King (or, according to Christopher Columbus, Dias himself) gave it the more cheering name of the Cape of Good Hope.

While Dias was rounding the Cape, the King, fearing lest his vessels might fail to reach Prester John, sent another message to that potentate, overland, by Pedro de Covilhão and Alfonso de Payva. From Aden, in Arabia, Payva made his way to Abyssinia, where he was killed, while Covilhão went eastward to India. From Goa Covilhão sailed to Sofala, in Eastern Africa, where he gathered news of Madagascar, and satisfied himself that it would be possible to go around to the western side of Africa by water. His report reached Portugal in 1490, but it was seven years before Vasco da Gama (q.v.) proved its correctness, in November, 1497. Starting from Lisbon, he doubled the Cape, and after encountering storm and tempest and the southern sweep of the Mozambique current, sighted, on Christmas Day, 1497, the land which still bears the name he gave it in honor of the day—Natal. After touching at Mozambique and Mombasa, he arrived on Easter at Melinda, where he found a pilot who took him across to India. The land was sighted on May 17, 1498, and three days later Da Gama anchored off Calicut.

Modern Exploration. Thus far the Portuguese had been almost alone in the exploration of Africa, but in the second half of the eighteenth century a new era of discovery began—an era in which men of several nationalities have had a share, and by the results of which several nations have sought to profit. The new line of explorers is headed by James Bruce (q.v.), a Scotchman who had been British consul at Algiers from 1763 to 1765. While in Egypt in 1768 he conceived the plan of seeking for the sources of the Nile. After crossing the Red Sea to Jiddah, he entered Abyssinia by the way of Massowah, and proceeded to Gondar, where he won the favor of the Negus. After some delay he succeeded in reaching the headwaters of the Blue Nile, and believed that he had found the true source of the main river. He arrived in


AFRICA
SCALE OF STATUTE MILES
0 200 400 600 800 1000
SCALE OF KILOMETERS
0 200 400 600 800 1000 1200 1400 1600
British
French
German
Portugese
Spanish
Italian
Belgian
Turkish
Important towns are shown in heavy face type
Railways
Canals
L.L. POATES ENGR'G CO., N.Y.
A 30° B 20° C Long. 10° West D 0° E Long. 10° East F from
FAYAL
AZORES (Port.)
S. MIGUEL
LISBON
PORTUGAL
SPAIN
Cadiz
Str. of Gibraltar
Gibraltar
Tangier
Ceuta
MEDITERRANEAN
ALGERIA
TUNIS
SICILY
MALTA
MADEIRA IS. Port.)
Funchal
SALVAGES
CANARY IS. (Sp.)
PALMA
FERRO
TENERIFFE
GRAN CANARIA
FUERTEVENTURA
LANZAROTE
MOROCCO
FEZ
Mogador
Agadir
ALGERIA
TRIPOLI
FEZZAN
Constantine
Biskra
Gabes
el-Golea
Wargla
Gardaia
Ghadames
C. Bojador
C. Garnet
RIO DE ORO
Rio de Oro
C. Barbas
C. Blanco
C. Mirik
ADRAR
el-Juf
SAHARA
Taudeni
IMOSHAGH
HOGAR
TAWAREK
Timbuktu
AIR OR ASBEN
TIBESTI
TIBBU
BORKU
KANEM
Agadem
Bilma
FRENCH WEST AFRICA
MILITARY TERRITORIES
NIGER TERRITORIES
SENEGAMBIA
SENEGAL
SUDAN
ST. LOUIS
C. Verde
DAKAR
BATHURST
GAMBIA
PORT. GUINEA
BISSAO
BISSAGOS IS.
FRENCH GUINEA
KONAKRY
FREETOWN
SIERRA LEONE
SHERBRO I.
LIBERIA
MONROVIA
Robertsport
Grand Bassa
IVORY COAST
GOLD COAST
TOGO
DAHOMEY
Kumassi
Akkra
Lome
Porto Novo
LAGOS
NORTHERN NIGERIA
SOUTHERN NIGERIA
Sokoto
Kano
Zaria
ZUNGERU
Ibadan
Bornu
Yola
KAMERUN
Duala
L. Tchad
TCHAD
UPPER GUINEA
GULF OF GUINEA
C. Palmas
C. Three Points
Cape Coast Castle
FERNANDO PO (Sp.)
PRINCIPE I. (Port.)
ST. THOMAS (Port.)
ANNOBON (Sp.)
SP. GUINEA
LIBREVILLE
C. Lopez
GABON
FRENCH CONGO
Brazzaville
LOWER GUINEA
KABINDA (Port.)
Banana
BOMA
KONGO
Leopoldville
San Salvador
Ambriz
LOANDA
Novo Redondo
Benguela
Mossamedes
Port Alexander
ANGOLA
Cunene R.
C. Frio
Swakopmund
WALFISH BAY (Br.)
GERMAN SOUTHWEST AFRICA
DAMARALAND
NAMALAND
Angra Pequena
Lüderitz Bay
Port Nolloth
St. Helena B.
CAPE TOWN
Cape of Good Hope
EQUATOR
TROPIC OF CANCER
TROPIC OF CAPRICORN
SAO VICENTE
SAL
BOA VISTA
CAPE VERDE IS. (Port.)
MAIO
SAO THIAGO
ASCENSION I. Br.
ST. HELENA (Br.)
ATLANTIC OCEAN
1 2 3 4 5 6 7
30 20 10 0 10 20 30



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Cairo in 1773. His account of his journey and the increasing interest in the slave traffic led to the organization, in 1788, of the African Association, expressly intended to promote the exploration of the unknown parts of the continent. In 1795 the association dispatched Mungo Park (q.v.), a young Scotchman, to the mouth of the Gambia, to explore the interior and to find the Niger, on which was supposed to be the negro city of Timbuktu. Passing up the Gambia, Park, after many adventures, reached the Niger, which he traced for a considerable distance along its middle course. He returned to England, but again set forth in 1805, intending to travel overland to the Niger, and by sailing down that stream prove his theory that it was identical with the river which was known at the mouth as the Congo. He was drowned at Bussa, with one of his companions, and all the other members of the party succumbed to fever.

Meanwhile, the Portuguese Brazilian F. J. de Lacerda in 1797 started from the Zambezi to cross the continent from east to west, but died near Lake Moero. Other Portuguese explorers traversed this region from both sides during the next thirty-five years. The stories that Park had heard and published about the mysterious city of Timbuktu aroused great curiosity. The city was reached in 1811 by a British seaman named Adams, who had been wrecked on the Moorish coast and carried inland as a slave, but was ransomed by the British consul at Mogador. In 1822 Major Denham and Lieutenant Clapperton (q.v.) attempted the trans-Saharan route to Timbuktu. From Murzuk, the capital of Fezzan, they made their way to Lake Chad and thence to Bornu, adding, in a second trip by Clapperton from Benin to the Niger, some two thousand miles of route to the known geography of West Africa. In 1826 Timbuktu was reached by Major Laing (q.v.), who was murdered there. In 1828 René Caillié reached the far-famed metropolis, and his report aroused widespread interest, one sign of which was the prize poem with which Tennyson began his public career. The doubtful geographical problem of the course and mouth of the Niger was finally solved, 1830-34, by the Lander brothers. At this time the exploration of the Nile was carried on under the auspices of Mehemet Ali, its course being traced almost to the equator. In 1847 the German missionaries Krapf and Rebmann discovered the peaks of Kilimanjaro and Kenia.

The middle of the nineteenth century marked the introduction of the distinctly scientific spirit into African exploration. Heretofore the thirst for adventure, the desire to develop a profitable trade, and a somewhat sentimental humanitarianism had been the chief motives of the expeditions. The era of systematic scientific exploration was ushered in by Dr. Heinrich Barth (q.v.), a German in the English service. The primary object of his activity was the opening of trade with Central Africa. He left Tripoli early in 1850 with James Richardson, who died soon after leaving Bornu, where the party had separated. Overweg, another of the leaders, was the first European to sail on Lake Chad, and died in 1852. Barth, for four years, conducted extensive explorations in the heart of Africa. From Lake Chad he crossed Haussaland to the Niger, thence across country to Timbuktu, thence back to Say on the Niger, to Sokoto, to Kukawa in Bornu, and across the desert to Tripoli, whence he returned to England with the most valuable contribution yet made to the geographical knowledge of interior Africa. His voluminous works are of the highest value. Before Barth started from the north, another of the greatest of African explorers, David Livingstone (q.v.), had unostentatiously begun his remarkable career. He had settled in 1841 in Bechuanaland, and, gradually pushing northward, discovered Lake Ngami in 1849. In 1851 he arrived at the Zambezi. He prepared himself thoroughly for more extended work, and went to the Zambezi again in 1852, followed up the river almost to its source, crossed to Angola, and then returned and followed the Zambezi to its mouth. He went to London in 1856. Burton (q.v.) and Speke (q.v.) explored Somaliland in 1854, and in 1856 led an expedition under the auspices of the Royal Geographical Society, which discovered Tanganyika and the southern shore of Victoria Nyanza, which Speke and Grant explored from 1860 to 1864. Numerous Austrian, Italian, German, and English explorers had been working in the Nile region. Sir Samuel Baker explored the Abyssinian branches of the Nile, met Speke and Grant in 1864, and discovered the Albert Nyanza and its connection with the Nile. Livingstone, between 1858 and 1864, explored the River Shire and discovered Lake Nyassa. He renewed his work in 1866, going from the Ruvuma River to Nyassa, Tanganyika, Moero, the Luapula River, and Bangweolo, where he arrived in 1868. Thence he went to Tanganyika and Nyangwe on the Upper Congo, which he called the Lualaba. At Ujiji a relief expedition sent by the New York *Herald* under H. M. Stanley (q.v.) met him in 1871. Livingstone soon returned to Lake Bangweolo, where he died in 1873. Another relief expedition sent out by the Royal Geographical Society in 1873 under Lieutenant Cameron, starting at Zanzibar, learned of Livingstone's death, but went on, mapped Lake Tanganyika, found that the Lualaba was really the Congo, and reached Benguela in 1875, having crossed the continent.

While the solution of the problem of the sources of the Nile was being achieved, important accessions were made to the knowledge of the geography of Western Africa. Du Chaillu explored the country back of the Gabun and the region of the Ogowe, and Burton in 1861 scaled the Peak of Kamerun.

Dr. Gerhard Rohlfs (q.v.), a German serving in the foreign legion in Algeria, began to make explorations in Algeria and Morocco about 1860, and in 1866 succeeded in making the journey across the desert to the Gulf of Guinea. Another German, Dr. Nachtigal (q.v.), intrusted by the Prussian Government with a mission to the Sultan of Bornu, started from Tripoli in 1868, explored the mountains in the central Sahara, and the whole of the eastern Sahara and Sudan. In 1875 Stanley circumnavigated the two great lakes, Victoria Nyanza and Tanganyika, crossed to the Congo, embarked upon that river at Nyangwe, in 1876, and followed its course to the Atlantic, which he reached in August, 1877. Schweinfurth (q.v.), a native of Riga, ascended the White Nile in 1868, discovered the Welle River, and returned to Egypt in 1872, having accumulated a large amount of information. Leopold II., King of the Belgians, took an active interest in the work going on in Africa, and in 1876 organized the International African Association, in which most of the European countries were associated. Several geographical and scientific expeditions were the product of this organization, and stations were opened from Zanzibar to Tanganyika. In 1879 Stanley was sent into the Congo country, supported by funds furnished chiefly by Leopold, and worked for five years in that region in the name of the association. Several thousand treaties were made with native chiefs, by which territorial rights of more or less value were acquired, and permanent posts, with regular routes of trade and travel, were established along the course of the river. The purpose was to found a State which should be a civilizing centre, in the heart of Africa. For a time there was some international interest in the project; but for several years those European powers which had been active in African exploration had been looking forward to possible political results, and the institution of such a State, with a territory comprising about one-eleventh of the whole continent, seems to have been the signal for the rise of territorial claims on all sides. Interest in the international enterprise died out, and the King of the Belgians was left free to develop the Congo State into a Belgian dependency. The English hoped to make it an English possession, and the attempt of Great Britain to come to an agreement with Portugal, whose territory in the southwest touched that of the Congo State, led to the assembling in 1884 of the Berlin Conference, called to bring about an international agreement in African affairs. The results of this conference are described in a subsequent paragraph.

Of the long list of African explorers up to this time only those have been mentioned whose work marked a distinct advance in the knowledge of the continent. There may be added to the number, prior to 1885, the Portuguese Serpa Pinto (1877-79), and Capello and Ivens (1884-85), who made valuable explorations in South Africa; Junker (1880-83), a traveler, whose examination of the western watershed of the Nile was of great value; Joseph Thomson (1883-84), who made thorough studies of the mountainous country between Mombasa and the lakes, and likewise in West Africa and the Atlas Mountains; Wissmann (1881-82), who crossed the continent and returned through the southern side of the Congo basin; Oscar Lenz, who, in 1879-87, went from Morocco to Senegambia by the way of Timbuktu, ascended the Congo, and traveled to the Zambezi by the way of Tanganyika; Brazza, who explored the country between the Ogowe and Congo; and Emil Holub, who added greatly to the knowledge of the natural history of South Africa.

Much has been done in the way of exploration since 1885, the object generally being to perfect geographical and scientific knowledge of the different regions. Of such expeditions, the best known and one of the most noteworthy was Stanley's mission, undertaken in 1887, in search of Gordon's lieutenant, the German Schnitzer, better known as Emin Pasha, who had retreated into the interior after the fall of Khartum. Stanley went up the Congo and crossed to Zanzibar. On the journey he traversed the dense and vast forest inhabited by diminutive savages, and thus confirmed ancient accounts of African Pygmies. The predominance of the British in Egypt and in South Africa, and the fact that the territory under British influence stretches with but one break (German East Africa) from the mouth of the Nile to Cape Town, has given rise to the project of a trunk line railway "from the Cape to Cairo," a project which is likely to be carried out at no distant day, with far-reaching consequences in the development of the continent. This plan led to the crossing of the continent from south to north by Ewart S. Grogan and Arthur Sharp in 1899. This journey was productive of much valuable information regarding the country which the transcontinental line is expected to traverse in the volcanic region around Lake Kivu and on the eastern shores of Lake Albert Edward and the Upper Nile. A host of scientific investigators and explorers have in the last twenty years done useful work in various African fields. Among such, special reference should be made to Donaldson Smith in connection with explorations in Somaliland. Two notable expeditions of recent years were those of Marchand, who in 1896-98 traversed the continent from Loanga in French Congo to Fashoda on the Nile, and Foureau whose journey, in 1900, across the Sahara from Algeria to Lake Chad marked an epoch in African exploration. The Chad region and the Sahara have received the particular attention of French explorers. Between 1902 and 1904 Loeffler and Lenfant established the existence of a channel between the Shari and the Binue rivers, thus showing a possible water connection between Lake Chad and the Atlantic. Chevalier in 1902-04 explored the region south of Wadai and Darfur constituting the watershed of the Congo, the Shari and the Nile. Between 1900 and 1904 Ch. Pierre crossed the continent, following the same general route as Marchand. The western Sahara was crossed in 1904 for the first time since Caillié's journey of 1828 by Laperrine and Théveniaut, who, setting out from Ain Salah and Timbuktu respectively, met at Timiaouine in 21° north latitude. In 1904-05 an expedition under Alexander and Gosling was active in the Chad region. In 1905 Gautier crossed the Sahara from Tuat to the Niger.

The Partition of Africa. The Berlin Conference is important in the history of Africa as marking the transition from a period of explorations undertaken in a spirit of scientific curiosity or gain to a period in which the play of international politics is the most prominent feature. The crucial question before the conference was that of the Congo State (q.v.) and its relations with neighboring territories. Ultimately it was recognized as an independent, neutral State, under the personal sovereignty of the King of Belgium. The title of France to the territory of the French Congo and the Upper Ubanghi was acknowledged, with a right of preemption in case of the transfer of the Congo State from Belgium to another power. The conference also determined the spheres of the several interested powers in Africa, so that the numerous boundary treaties and agreements that have been arranged since 1885 have virtually been executory provisions added to the Berlin convention. Three such treaties were concluded by Great Britain in 1890. The Anglo-German agreement, signed at Berlin, July 1, gave Germany the island of Heligoland in the North Sea in return for certain concessions which harmonized the relations of the two powers in Eastern Africa; the Anglo-French agreement, signed at London, August 5, recognized an English protectorate over Zanzibar and Pemba and a French protectorate over Madagascar, and determined the French sphere of influence as extending from

Algeria southward to a line from Say on the Niger to Lake Chad; the Anglo-Portuguese agreement, August 20 and November 14, established the respective territorial rights of Portugal and the British South Africa Company. The question of the control of the Nile region and of South Africa gave rise to numerous attempts to secure adjustments in that quarter, and every year from 1891 to 1904 saw agreements of demarkation concluded among the European powers relative to their interests in Africa. By this process of absoption by agreement, the whole African continent has come into actual possession or political control of European States, with the exception of Morocco, Abyssinia, and Liberia, and in the case of the first of these, the establishment of French control in accordance with the Anglo-French agreement of April 8, 1904, was checked only by the intervention of Germany in the spring of 1905. (See MOROCCO.) The Orange Free State and the Transvaal lost their independent existence in the war with Great Britain (1899-1902).

The partition of the African continent may be summarized as follows: In the northeast, Egypt, nominally under Turkish suzerainty, is really under British control, while Egypt and Great Britain exercise a condominium over the eastern Sudan. Tripoli remains subject to the Porte. Tunis and Algeria pertain to France, whose influence reaches down across the Sahara and Sudan to the northern slope of the Congo basin. On the west coast below Morocco is the small Rio d'Ouro possession of Spain. Then come the French Mauretania and Senegal, British Gambia, Portuguese Guinea, French Guinea, the British Sierra Leone, Liberia, another block of French territory, the British Gold Coast and Ashanti, German Togoland, French Dahomey, the extensive British Niger territories, and German Kamerun. Off the coast of Kamerun lies the Spanish island of Fernando Po, to which are attached some other small islands and a small district on the mainland cut out of the French Congo territory. Below the latter lies the Congo Free State, with but a small coast line, the wedge of the small Portuguese territory of Kabinda pushed in between it and the French Congo. South of the Congo lies the large Portuguese territory of Angola, then German South Africa, and then Cape Colony, one of the British self-governing possessions. North of the latter on the east coast is the British colony of Natal, and north of that Portuguese East Africa. Between the two latter and German West Africa and Angola, the territories of British South Africa and British Central Africa in the interior extend northward to the Congo State and to German East Africa, which occupies the east coast north of Lake Nyassa and the Ruvuma River. North of German East Africa lies British East Africa, which touches on the north the British sphere of influence in the Sudan, Abyssinia, and on the coast, Italian Somaliland. West of the latter on the Gulf of Aden is the British Somali coast protectorate, then French Somaliland, and then the Italian Eritrea, the four territories last named shutting Abyssinia off from the coast.

The area of Africa was estimated in 1904 at about 11,500,000 square miles, inclusive of islands, and the population at about 140,000,000. The political distribution of area and population according to the latest available figures is approximately as follows:

UNDER EUROPEAN CONTROL

Country	Square Miles	Population
France	3,940,000 *	31,533,000 *
Great Britain	3,630,000 †	49,497,000 †
Belgium (Congo Free State)	920,000	19,000,000
Germany	908,000	11,465,000
Portugal	800,000 ‡	6,864,000 ‡
Turkey	406,000	1,000,000
Italy	190,000	730,000
Spain	82,000 §	672,000 §

INDEPENDENT STATES

Country	Square Miles	Population
Abyssinia	310,000 ¶	8,320,000 ¶
Morocco	176,000	7,000,000
Liberia	36,840	1,000,000

* Including Madagascar.
† Including Egypt and Sudan.
‡ Including the Madeiras and Azores.
§ Including Canary Islands.
¶ Largely conjectural.

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AFRICAINE, L', lȧ'frê'kȧn' (Fr., The African). A French opera by Giacomo Meyerbeer (q.v.). The words are by Scribe, and it was produced in Paris, April 28, 1865, a year after the composer's death.

AF'RICAN'DER. See AFRIKANDER.

AF'RICAN HAIR. See CHAMÆROPS.

AFRICAN IN'TERNA'TIONAL ASSO'CIA'TION. In 1876 the King of Belgium called a conference at Brussels of geographers and explorers to consider means for the opening up of Africa to civilization, and there the African International Association was formed, with the object of establishing stations for scientific purposes in Eastern Africa. When H. M. Stanley in 1877 revealed the magnitude and importance of the fertile Congo basin, a second conference was assembled at Brussels, at which the African International Association made plans which extended its field of operation over the newly explored territory. But the greed of the different nations, awakened by the dazzling territorial and commercial prospects the Congo basin afforded, brought about endless disputes, until at length it was decided, by the mutual consent of all the great powers, including the United States, to leave the final adjustment of the difficulties to an international conference in Berlin. The conference opened at Berlin, November 17, 1884, with Prince Bismarck in the chair, and ended its labors February 26, 1885. Fifteen States were represented. As a result of mutual compromises, it was declared that the immense regions forming the basin of the Congo River and its tributaries shall be neutral territory, that perfectly free trade shall exist there, that citizens of any country may undertake every species of transportation within its limits, that the powers exercising sovereign rights over neighboring territory are forbidden to exercise monopolies or favors of any kind in regard to trade, and that they shall bind themselves to suppress slavery. The King of Belgium was made sovereign of the new State. See AFRICA; CONGO FREE STATE; STANLEY, H. M.

AFRICAN LAN'GUAGES. Of the numerous classifications of African languages, that which best represents our present knowledge is the following:

1. SEMITIC: Arabic; the Abyssinian languages derived from Geez (the so-called Ethiopic), i.e., Tigré, Tigriña, Amharic, Harari, Gurague. The languages comprised in this division were brought into Africa by Semitic immigrants or invaders.

2. HAMITIC: Libyan dialects; ancient Egyptian (whence Coptic, now extinct), Bishari (Beja, Bedauye), Saho, Afar, various Agau dialects of Abyssinia (Chamir, Quara, etc.), and

of the highlands south of it (Kaffa, Kullo, etc.), Galla, and Somali, Haussa in the west of the Sudan.

3. HOTTENTOT-BUSHMAN. Possibly this branch represents two different divisions. This is the theory of F. Müller. But the Bushman dialects have not yet been sufficiently investigated. Lepsius' attempt to connect Hottentot and Hamitic words is not convincing. None of the dwarf tribes north of 8° south latitude have preserved their original languages.

4. THE BANTU FAMILY; which embraces, roughly speaking, all Africa south of the equator. Its most perfect type is represented by the language of the Zulu Kaffirs and their nearest relatives. To what extent corrupt Bantu dialects are spoken on the western coast has not yet been determined.

5. THE NEGRO FAMILY; so called because the languages included in it are spoken by the purest representatives of the black race. The idioms of that part of Africa (between the equator and the Sahara) show such a perplexing variety of formation that their classification in a single group must be considered as merely provisional. Perhaps half a dozen different branches could be made of the Negro tongues. It is quite possible that the line of demarkation from the Bantu or half Bantu languages could be shifted further north (see above); but the theory of Lepsius, which considers the whole group as degenerate Bantu languages, can hardly be proved; the degree of affinity would be ten times more remote than, for example, that existing between Semitic and Hamitic. But whether it be regarded as a subdivision of Bantu or as an independent branch, the Negro family clearly forms a distinct group, possessing marked characteristics of its own.

The nature of the following groups is in dispute:

6. THE NILOTIC BRANCH. It begins with the Nuba, south of Egypt, comprises the isolated remnants of the Barea and Kunama languages at the northern frontier of Abyssinia, and runs west of Abyssinia and of the Galla country down to the Albert Lake, where the Madi and Shuli form its last representatives. It is quite distinct from the Bantu (beginning in Unyoro). The Masai or Oigob are an isolated advance guard in the southwest. The principal representatives in the Nile Valley are the Dinka, Shilluk, and Bari. The line of demarkation west of the Nile is difficult to trace; with the Bongo and Bagrimma, the Nilotic passes over into the perplexing mass of the fourth group. F. Müller called the sixth the Nuba-Fulah branch, but the very peculiar Ful language is best treated as a perfectly isolated phenomenon. It seems to have some points of similarity with the Hamitic (on which points Schleicher and Krause have laid exaggerated stress), and may be one of those odd blendings of different languages, defying all rules of linguistics, of which Africa furnishes various examples (e.g., the Musgu or Muzuk). Its position among the Nilotic languages is far from being certain. Anthropologically, the tribes speaking the languages embraced in this class are for the most part pure Negroes, though some of them may have an admixture of Hamitic blood.

7. THE EQUATORIAL FAMILY. Later (1889), F. Müller attempted to make of a group of languages, which he had at first classed with the fifth family, a special branch, which he called the Equatorial family. The languages composing this branch are spoken by tribes south of Darfur; among them the Niam-Niam (or A-sande) and Monbuttu (or Mangbattu) are the most important. As was said above, the great fifth group contains a number of families in regard to which it is hard to determine whether they are independent branches or merely subdivisions of the general group. Most of the equatorial tribes belong rather to a light Negro type.

The Malagasy language, spoken on the island of Madagascar, belongs to the Malay family of speech. By reason of its geographical position it need not be considered here.

WRITING. The use of writing and the necessity for it imply a degree of civilization to which the majority of the inhabitants of Africa have never risen. It is, therefore, almost exclusively the white race, represented by the Hamites and the Semitic immigrants, which comes into consideration here.

SEMITIC. In the Semitic family we have the Phœnician alphabet, used by the Carthaginians along the northern coast. The Punic and later Neo-Punic characters were modifications of the Phœnician, and are distinguished by special characteristics. The Arabic character is now used wherever Islam has become the prevailing religion; but it is mainly employed for writing the Arabic language, which forms the general medium of religion, commerce, and social intercourse. The use of the Arabic character for African languages is not very frequent (e.g., among the Berbers, the Suahelis). The Malayan immigrants, however, and the Mohammedan Kaffirs use it as far south as Cape Colony; and the Mohammedans of Shoa as well as the inhabitants — also Mohammedans — of Harrar sometimes write their respective languages, Amharic and the closely related Harari, in Arabic letters. On the other hand, in and around Abyssinia a number of languages are regularly written in the Amharic modification, or rather amplification, of the old Ethiopic or Geez alphabet. Unlike most of the other Semitic languages, Ethiopic and its modern descendants are written from left to right. The vowels are expressed graphically by modifications of or slight additions to the consonants, thus forming a kind of syllabary. We can trace this peculiar system of writing as far back as the fourth century A.D., through some ancient monuments in the old capital of Axum (consult D. H. Müller, *Epigraphische Denkmäler aus Abessynien*, 1894). The development of those peculiarities took place on African soil, though the consonantal characters are derived from the old South Arabian writing (wrongly called Himyaritic). See ETHIOPIC WRITING.

ANCIENT EGYPTIAN. From the Egyptian hieroglyphic writing was developed a cursive form, the Hieratic, and this in turn gave rise to the still more cursive Demotic. All these have long since passed out of use, though Coptic, which survives only as the ritual language of the native Egyptian church, retains in its alphabet a few characters derived from the Demotic.

ETHIOPIAN. The ancient Ethiopians of Napata and Meroë had, beside the Egyptian systems of writing, which they used almost exclusively for the Egyptian language, a cursive system of their own for the native idiom. As the few inscriptions in this character which have been preserved have not yet been deciphered, it is not possible to say anything positive about it. It is even doubtful what language these inscriptions represent, although it is perhaps nearer to the (negroid) Nuba than to the Hamitic Beja or Bishari. The alphabet was evidently borrowed from outside sources, though whether Egyptian or South-Arabic elements underlie it, cannot at present be determined.

LIBYAN or NUMIDIAN. The old Libyan or Numidian writing, a very imperfect system, goes back to the ancient alphabet of south Arabia (as Euting has clearly shown), and not to Punic. It is represented by many inscriptions in Algeria and Tunis. The first decipherment, on the basis of the famous bilingual inscription of Tukka, is due to Blau (see also Halévy, *Essai d'épigraphie Libyque*, 1875, a collection by Faidherbe, 1870, etc.). It is worthy of note that the ancient funeral inscriptions in this character read from below upward. This system is similar to the *tifinaghen* or alphabet of the modern Sahara tribes (or Tuaregs). Oudney is said to have been the first who observed and called attention to their peculiar system of writing (1822). The best description of the alphabet is to be found in Hanoteau, *Grammaire de la langue Tamachek* (1860).

NEGRO. Only one Negro language has developed a writing of its own, the Vei, on the west coast near Cape Mount. Doalu Bukere, a native who knew something of the Roman character, invented it about the year 1834. The writing was afterward used for Mohammedan missionary work. It is a clumsy syllabary with complicated forms sometimes suggestive of hieroglyphics, and quite distinct from European or Arabic writing. A number of books have been written in it, but the Christian missionaries have declined to use it, and it is dying out. It has received considerable attention from linguists, as the only case known in which the actual invention of a system of writing, in popular use, can be clearly shown. The idea, however, was certainly borrowed from the Europeans. Consult: Steinthal, *Die Mande-Neger-Sprachen* (Berlin, 1867).

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AFRICAN METH'ODIST EPIS'COPAL CHURCH. See METHODISM.

AFRICAN METH'ODIST EPIS'COPAL ZI'ON CHURCH. SEE METHODISM.

AFRICAN MIL'LET. See SORGHUM, NON-SACCHARINE.

AFRICAN OAK. See TEAK.

AF'RICA'NUS, SEXTUS JULIUS. A Christian writer. He was born in Libya, and made his home in Emmaüs, near Jerusalem, from 195 on till after 240, but traveled extensively through Asia Minor. He is remembered for his chronology from the creation to 221, of which fragments are preserved. These and portions of other writings are printed in Migne, *Patrologia Græca*, X. 51-108, XI. 41-48; English translation, *Ante-Nicene Fathers* (N. Y. edition), VI. 123-140.

AF'RICAN WAR, THE. In Roman history, the war between Julius Cæsar and the members of the Pompeian party who, after the battle of Pharsalia, renewed the conflict in Africa and were defeated at Thapsus, 46 B.C. The account known as the *Bellum Africanum* attached to the works of Cæsar is of uncertain authorship.

AFRIDIS, ȧ-frē'dēz. One of the Afghan or Pathan peoples of the Indo-Afghan border who have of recent years come into hostile contact with the British authorities. In their somewhat savage yet intelligent semi-independence they represent, perhaps, ancient Aryan society of an early type. A brief account of them by Holdich appeared in the *Journal of the Anthropological Institute* (London) for 1899.

AF'RIKAN'DER. The Dutch form for "African," used of white persons born in South Africa, especially the Boers.

AFRIKANDER BUND, bụnt, or **BOND.** An association in South Africa designed to consolidate Africander influence and eventually to form an independent union of the South African States. With its present name it dates from 1880. As a political party in Cape Colony it for a time supported the policy of Cecil Rhodes, but after the Jameson raid (1895) it separated itself from him. In 1898 it secured a majority in the colonial legislature. While it urged President Kruger to a more liberal policy, it favored the Boers in the war with Great Britain. On December 6, 1900, an Africander congress was held at Worcester, Cape Colony, which demanded Boer independence and condemned the war. After the war (Dec., 1902), the Bund was reorganized to further the federation of the South African colonies under the British crown, and became largely identified with the South African party, which represented the interests of the Afrikanders without assuming an exclusively Dutch character.

AFRITE, ăf'rēt. A powerful spirit, or jinn (Lat. *genius*), figuring in the stories of *A Thousand and One Nights.*

AF'TER-IM'AGES. Retinal images which appear after the eye has been removed from some illuminated object. When we light our lamp in the evening we are distinctly conscious that the illumination has a reddish-yellow tinge. As time goes on, however, we lose the color; the paper on which we write seems to be as white as the same paper seen in diffuse daylight; our eyes have become adapted, or have grown used, to their surroundings (*general adaptation*). The law of adaptation is that all brightnesses tend toward a middle gray, and all colors toward neutrality. Adaptation leaves an after-effect, which is termed *disposition.* A yellow-adapted eye is disposed to the complementary color, or blue-sighted: all the yellows that it sees tend toward gray, and all other colors take on a tinge of the complementary blue. See CONTRAST; VISUAL SENSATION.

Adaptation may be *local,* as well as general. Suppose, e.g., that I fixate steadily a green disk seen upon an extended white background. The part of the retina upon which the green falls will become green-adapted, and therefore red-disposed or red-sighted. Hence, if I presently remove the green disk I shall see a subjective red disk in its place. This red, the after-effect of local adaptation, is termed (1) the *negative after-image.* The color and brightness of the after-image are always complementary to the color and brightness of the preceding stimulus; a dark-blue stimulus gives a bright yellow after-image, and a bright yellow stimulus a dark-blue after-image. If one stares for half a minute at a window that gives upon a bright gray sky or a snowy landscape, and then turns one's eyes upon a gray screen or wall, one sees an after-image window with white bars and black panes. In general, the vividness and duration of the negative after-image depend upon the intensity and duration of the stimulus which evokes it, and on the brightness of the surface upon which the after-image is projected for observation. It is probable, although the point is still disputed, that the course of the after-image is intermittent, not continuous. Theoretically important is the fact that a contrast-color (see CONTRAST) set up in the neighborhood of the stimulus is effective in the after-image; thus, a disk of red paper seen on a gray background, and giving a narrow green ring of marginal contrast, appears in the after-image as a green disk surrounded by a distinct reddish halo. (2) If the original stimulus be very strong and of brief duration, it may give rise to what has been called the *positive after-image,* a subjective phenomenon in which the stimulus-sensation is reproduced, only with diminished brightness and saturation. (See VISUAL SENSATION.) Thus, a flash of brilliant red light would be followed, first, by a brief, but noticeable, blank interval; then by the positive after-image, a duller and pinker red; then by a second interval, somewhat longer than the first; and, finally, by the dark-green negative image. The usual explanation of this positive image is that the physiological effect of stimulation persists for some time after the physical stimulus itself has ceased to operate; the sensation, therefore, outlasts the stimulus, remaining the same in kind throughout its course. This account is, however, as inadequate as is the theory which would account for the negative after-image on the score of retinal fatigue. It is disproved by the single fact that the short interval which elapses between stimulus and positive image (the first interval described above as "blank") may, under certain circumstances, be filled by a *positive* and *complementary image.* Thus, if a glowing red point be moved slowly to and fro in the dark, one sees first a trail of red light (due to the stimulus and its direct after-effect), and then a bright (positive) green streak. Then should follow, if the series is complete, the positive image proper, a dull red, the second blank interval, and the negative green image. The dull red is, evidently, not a direct continuation of the red of the stimulus. No satisfactory theory is as yet forthcoming.

Especial interest attaches to the colored images obtained from intensive stimulation with white light. Close your eyes and keep them closed until there is no trace of previous stimulation (no colored after-image) on the dark field. Then fixate for some twenty seconds the middle bar of a window which looks out upon a brilliantly white sky. Close your eyes again, and note the development of the after-image on the dark field. You see a color sequence, which is known technically as the *flight of colors.* The current explanation of the phenomenon is that the white light of the sky is broken up into its physical components, in somewhat the same way as a ray of light passing through a prism is broken up into the series of spectral colors; and that the retinal excitations corresponding to the red, green, and violet stimuli (the part-stimuli contained in the white light) are not exactly coincident, but overlap in time, so that now the one and now the other shows itself in the after-image. It is, however, noteworthy that the flight of colors, under conditions of exact observation, shows unmistakable evidence of two overlapping complementary series. The sequence is: a momentary positive image; then, after fluctuations, a blue, a green, a yellow, a red (at this stage the image becomes negative), a blue, and a green image. We have, that is, the series blue-yellow-blue and the series green-red-green laid over one another; there is clear indication of antagonism or complementarism, but none of a general breaking up of the white light into its spectral components. We must remember, also, that "white" light is never quite colorless; there is always some tinge of color in diffuse daylight. The facts point to the validity of an "antagonistic" theory of visual sensation (q.v.). (3) We may note, finally, the existence of a *binocular* or transferred after-image. If one eye be stimulated, under suitable conditions, a faint, positive image appears in the field of the other, unstimulated eye. Lay a bright red-orange disk upon a sheet of white paper and fixate it monocularly for five or ten seconds. Then blow away the disk, close the stimulated eye, open the unstimulated one and fixate the white ground. You see at first a pale-yellowish image. Then the field darkens and a blue negative image makes its appearance. Presently the ground clears and the yellowish patch comes once more. Then the white darkens again and the blue image recurs. The darkening is due to retinal rivalry: the dark field of the closed (stimulated) eye is superposed upon the bright field of the open (unstimulated) eye. The blue image is the negative after-image belonging to the dark field, i.e., to the originally stimulated eye; its appearance requires no explanation. On the other hand, the faint yellowish image belongs to the unstimulated eye, is an after-effect of the orange stimulation, but an after-effect that differs entirely from the after-effect in the stimulated eye, and that has been transferred to the eye which was not exposed to the stimulus. Its existence points to a close functional inter-relation between the two halves of the visual apparatus. Consult: H. von Helmholtz, *Physiologische Optik* (Hamburg, 1896); E. Hering, *Zur Lehre vom Lichtsinne* (Vienna, 1878); O. Kuelpe, *Outlines of Psychology* (London, 1895); E. B. Titchener, *Experimental Psychology* (New York, 1901).

AFZE′LIUS, *Sw. pron.* âf-tsā′lĭ-ōōs, ADAM (1750-1837). A Swedish naturalist, a pupil of Linnæus, whose autobiography he afterward edited. He was professor in the University of Upsala. He studied the flora of West Africa from 1792 to 1794, and wrote many botanical papers for the Danish Royal Academy and the

Linnæan Society of London. Several species of plants were named after him.

AFZELIUS, Arvid August (1785-1871). A Swedish poet and antiquary. He translated the *Elder Edda* (see Edda), and, with Geijer, edited a noteworthy collection of old Swedish popular songs (1814-17). He is esteemed for his poetical *Romances*, and for his studies in Norse history and literature. He was pastor at Enköping, 1821-1871.

AGADES, ă′gȧ-dâs. An African city, the capital of the oasis kingdom of Air (q.v.), situated in lat. 16° 30′ N. and long. 8° E. (Map: Africa, E 3). It was formerly an important city and had a population estimated at 50,000. Although still on the caravan route between Sokoto and the Barbary States, its commercial importance has disappeared, and its population has dwindled to about 7000.

AGADIR, ä′gȧ-dēr′. A seaport of Morocco, North Africa, situated in lat. 30° 27′ N. and long. 9° 36′ W. (Map: Africa, D 1). It was founded in the beginning of the sixteenth century by the Portuguese, but was soon taken by Morocco, and for a considerable period was an important shipping centre. It is at present closed to commerce, and is used as a customs station on the caravan route connecting the northern and southern parts of Morocco. Its population is about 1000.

A′GAG (Heb., Gk. 'Αγάγ, in the Septuagint). (1) The name, or possibly title, of a king of the Amalekites conquered by Saul, and preserved alive contrary to the command of Jehovah. He was afterward hewn in pieces by Samuel. See I. Samuel xv. (2) In Dryden's *Absalom and Achitophel*, a character standing for Sir Edmund Berry Godfrey, the justice of the peace who was assassinated shortly after disclosing the revelations made to him by Titus Oates.

A′GAGITE. A name applied to Haman (Esther iii. 1, 10; viii. 3). It is a term of contempt, designating him as a worthy descendant of Agag, the Amalekite whom Samuel hewed to pieces as a sacrifice to Yahweh at Gilgal (I. Samuel xv. 33). This "Amalekite" is opposed to Mordecai, a descendant of Kish, the father of Saul (Esther ii. 5). The Greek translator understood that this was a mere fiction setting forth the struggle between Jew and Gentile, when he rendered the term "Macedonian."

AGALACTIA, ăg′ȧ-lăk′tĭ-ȧ (Gk., want of milk, from *ἀ*, *a*, priv. + *γάλα*, *gala*, milk). A lack of the proper secretion of milk after delivery. It may depend either on organic imperfection of the mammary gland or upon constitutional causes. In the latter case the secretion may often be excited by warmth and moisture, by the stimulus of the act of sucking, and if this fails, by drinking plenty of fluids rich in fats and by drugs prescribed by a physician. (See Milk.) It is a contagious disease in sheep and goats, characterized by inflammatory foci in the mammary gland, eyes, and articulations. The disease has been known since 1816, and is especially frequent in Italy, France, and Spain. In the acute form there is high fever accompanied by complete, or almost complete, failure of milk. Death takes place after twenty days in about 15 per cent. of cases.

AG′ALMAT′OLITE. A hydrated aluminum and potassium silicate that occurs massive, and in color is gray, to green and yellow, brown and red. It is regarded as an alteration product of iolite, and is found in Transylvania, in Saxony, and especially in China, where, owing to its softness, it is carved into images and various ornamental designs, in which advantage is taken of the different shades to bring out special portions in different colors.

AG′AMA (Caribbean name). A genus of insectivorous ground-lizards allied to the iguanas, and confined to the warm climates of Africa, Australia, Asia, and southern Russia. The handsome armed agama, or toque (*Agama armata*) of South Africa is strikingly adorned and reaches twenty inches in length. Another very brilliant species is the spiny *Agama colonorum* of the Gold Coast. One of those of southeastern Europe best known is the stellio (*Agama stellio*), which is commonly tamed and kept in captivity by Arabic jugglers in Egypt, who call it *hardun*.

AG′AME′DES. See Trophonius.

AG′AMEM′NON (Gk. 'Αγαμέμνων). Son of Atreus, and brother of Menelaus. Agamemnon is a prominent figure in Greek heroic legend, and the details of his story differ. He ruled at Mycenæ and exercised lordship over much of the Peloponnesus. Therefore, when Paris carried off Helen, the wife of Menelaus, Agamemnon was the natural leader of the expedition against Troy. His quarrel with Achilles is the starting-point of the *Iliad*. Later writers told of the sacrifice of his daughter Iphigenia (q.v.) at Aulis to secure favorable winds for the voyage to Asia. In his share of the booty of Troy he received the prophetess Cassandra (q.v.), daughter of Priam. On his return he was murdered by his wife Clytemnestra (q.v.) and her paramour, Ægisthus (q.v.). His son, Orestes (q.v.), aided by his daughter Electra, subsequently avenged his father. This tragedy of the house of Atreus was a favorite subject of the Greek dramatists. Consult: *The Oresteia*, especially the first play, the trilogy of Æschylus called the *Agamemnon*.

AG′AMEN′TICUS, Mount. A hill in York Co., Maine, 4 miles from the sea, 673 feet high. It lies in lat. 43° 13′ 25″ N. and long. 70° 41′ 33″ W. (Map: Maine, B 9), and is a noted landmark for sailors.

AG′AMOGEN′ESIS. See Parthenogenesis, section *Metagenesis*.

AGAÑA, ȧ-gä′nyȧ, or San Ignacio de Agaña, sän ĕg-nä′thē-ō dâ ȧ-gä′nyȧ. The capital of Guam (q.v.), one of the Ladrones, belonging to the United States (Map: Guam, U. S. and Dep. Ter., B 3). It is situated on the western coast of the island on Agaña Bay. It has wide, clean streets, and is traversed by a shallow stream crossed by two stone bridges. The bay is unsafe and the landing is obstructed by reefs. The town contains an arsenal, barracks, and a college. During the Spanish régime in the Philippines it was the seat of government for the Ladrones. Pop., about 7000.

AG′ANIP′PE (Gk. 'Αγανίππη, *Aganippē*). A fountain in Bœotia, near Mount Helicon, which flows to the River Permessus. The water was sacred to the Muses, and gave poetic inspiration.

AGAO, ȧ-gä′ō. See Agau.

AG′APÆ (Gk. nom. pl. of *ἀγάπη*, *agapē*, love-feast). Love-feasts, or feasts of charity, usually celebrated by the earliest Christians in connection with the Lord's Supper. The rich Christians presented their poorer brethren in the faith with gifts, and all ate together, in token of their equality before God and their brotherly harmony. The meetings were opened and closed with prayer, and during the feast spiritual songs were sung. At first, a bishop or presbyter presided, who read a portion of the Scripture, proposed questions upon it, and received the various answers of the brethren. Afterward, whatever information had been obtained regarding the other churches was read—such as the official letters of overseers, or private communications from eminent members; and thus a spirit of practical sympathy was engendered. Before the conclusion of the proceedings money was collected for widows, orphans, the poor, prisoners, and those who had suffered shipwreck. Then the members gave one another the holy kiss and the feast was ended with a "philanthropic prayer." Generally the feast of the agape preceded the celebration of the Lord's Supper, but during the period of the persecutions, when the Christians had often to hold divine service before dawn, the agapæ were, for the most part, delayed till the evening. Later, a formal separation was made between the two rites. In the third and fourth centuries the agape had degenerated into a common banquet, where the deaths of relatives and the anniversaries of the martyrs were commemorated, and where the clergy and the poor were guests; but with the increase of wealth and the decay of religious earnestness and purity in the Christian Church, these agapæ became occasions of great riotousness and debauchery. Councils declared against them, forbade the clergy to take any share in their celebration, and finally banished them from the Church. At the same time, it must be admitted that the heathens ignorantly calumniated the practices of the Christians in these agapæ, and that the defense made by Tertullian, Minucius Felix, Origen, etc., is eminently convincing. The Moravians have attempted to revive these agapæ, and hold solemn festivals with prayer and praise, where tea is drunk and wheaten bread, called love-bread, is used. Somewhat similar are the agapæ of the Church founded by Wesley. See Love-Feasts.

AG'APEM'ONE (modern compound from Gk. ἀγάπη, *agapē*, love, + μονή, *monē*, a staying, stopping-place). A conventual establishment of a singular kind, consisting of persons of both sexes, founded at Charlynch, near Bridgewater, England, by Mr. Henry James Prince, formerly a clergyman of the Church of England. The inmates belong to a new religious sect originating with Mr. Prince and a Mr. Starkey, also a clergyman, and are sometimes called Lampeter Brethren, from the place where Prince was educated, and where, while a student, he formed a revival society also. Community of goods being insisted upon, the leaders acquired considerable property, and fitted up in luxurious style a dwelling near Charlynch. Prince, who was styled "The Lord," affirmed in his publications that he was sinless and was sent to redeem the body, "to conclude the day of grace, and to introduce the day of judgment." See Hepworth Dixon, *Spiritual Wives* (London, 1868), and the article by Miss Edith Sellers in *The Newbery House Magazine* (London, November, 1891), reprinted in *Magazine of Christian Literature* (New York, December, 1891).

It would appear that a society similar in its aims and character, though not conventual in its form, existed in England in the sixteenth and seventeenth centuries. It was called "The Family of Love." Its founder is generally supposed to have been Heinrich Nikolaus, who was born at Münster, in Westphalia, January 9 or 10, 1501 or 1502, but who lived a considerable time in Holland. He held himself to be greater than Moses or Christ, for the former only taught men to *hope*, and the latter to *believe*, while he first announced the doctrine of *love*. He founded his sect, "The House," or "Family of Love," in Emden, East Friesland, about 1540, and died in 1570. In the reign of Edward VI. the sect appeared in England. By 1578, they had apparently increased in numbers considerably, for in that year one John Rogers published a work against them, entitled *The Displaying of an Horrible Secte of Grosse and Wicked Heretiques, naming themselves the Familie of Love, with the Lives of their Authours, and what Doctrine they teach in Corners* (second edition, 1579). In 1580, Queen Elizabeth issued a proclamation for the hunting out and punishing of the "damnable sect." The family of love, "or lust, rather," as old Fuller has it, tried to insinuate themselves into the good graces of King James by presenting a petition casting aspersions on the Puritans. It had a brief prosperity, and was revived in the seventeenth century, when it was confounded with the Friends, but quickly died. Its name in New England in the seventeenth century was applied to some dissenters, but there is no evidence that there were any Familists there. Their doctrines seem to have been a species of pseudo-spiritual sentimentalism resulting in gross impurity. Consult Thomas, *The Family of Love*, "Haverford College Studies," No. 12 (Boston, 1893). See Muckers.

AG'APE'TÆ (fem. form of *Agapeti*). Early Christian virgins who lived, generally in all purity, in the same house with men bound to strict celibacy. See Agapeti.

AG'APE'TI (nom. pl. of Gk. ἀγαπητός, *agapētos*, beloved). Early Christian men who lived in the same house with deaconesses, both being celibates. The growth of ascetic notions in the Church led to the supposition that all contact between the sexes, except in marriage, must lead to immoral conduct, and so in the fifth and sixth centuries the practice was condemned by the Church and by the civil power.

AG'APE'TUS. The name of two popes. Agapetus I. Pope of Rome from 535 to 536. The fear of an invasion of Italy by Justinian led Theodatus, the King of the Goths in Italy, to send Agapetus to Constantinople in 536 to sue for peace from the Emperor. Though unsuccessful in this mission, Agapetus persuaded Justinian to depose Anthimus from the patriarchal see of Constantinople. He died at Constantinople. His festival is celebrated on the twentieth of September by the Roman Catholic Church. Agapetus II. Pope of Rome from 946 to 955; a Roman by birth. His first act was to establish his political rule over the churches of the empire. Against Berenger II., King of Italy, who was a troublesome neighbor to the little pontifical state, he invoked the aid of Otto I.

AGAPIDA, ä′gȧ-pē′dȧ, Fray Antonio. The imaginary monkish chronicler from whose papers Washington Irving professed in his first introduction to the work to have compiled his *Conquest of Granada*. He was intended, Irving later explained, as a type of the piously prejudiced religious zealots of the time.

AGAR, ȧ′gär′. The stage name of Florence Léonide Charvin (1836-91). A French actress. She was born at Sedan, and went to Paris in 1858, where she made her début as a singer in cafés-concerts. Following the example of Rachel, she adopted the biblical name of Agar (English, Hagar). In 1870 she was engaged at the Comédie Française, where, during a representation of the play *Le Lion Amoureux*, she sang the Marseillaise in the key of A, as Rachel had done in 1848. She appeared from 1872 to 1876 in many French classic dramas, chiefly tragedies. She was remarkable for her beauty, her mobile and expressive countenance, eloquence of gesture, and perfect diction.

AGARDH, ä′gärd, Jakob Georg (1813-1901). A Swedish botanist, son of Karl Adolf Agardh. He was professor of botany at Lund during 1854-79. He increased his father's large collection, and wrote several works on algæ. He also published *Theoria Systematis Plantarum* (Lund, 1858).

AGARDH, Karl Adolf (1785-1859). A Swedish botanist. He was educated at Lund, and devoted himself chiefly to the study of algæ. In 1807 he became lecturer on mathematics at Lund, and in 1812 was appointed professor of botany and rural economy, lecturing at the same time on general economy. He became a priest in 1816; went into politics in 1817, and was elected to the Diet, where he exercised considerable influence, became a leading liberal, and succeeded in improving and raising the standard of education in Sweden. His work, *Systema Algarum* (Lund, 1824), was an important contribution to the science of botany. He also wrote *Essai de reduire la physiologie végétale à des principes fondamentaux* (Lund, 1828). In 1834 he was made Bishop of Karlstad. Agardh was author of several books and papers, chiefly on algæ, and a memoir on Linnæus.

AG′ARIC, AGAR′ICUS. See Mushroom.

AGAR′ICIN (from Gk. *ἀγαρικόν*, *agarikon*, a sort of tree-fungus). A substance known also as agaric, agaricic, agaricinic, or laricic acid, and obtained from the *Polyporus officinalis*, commonly called white agaric, touchwood, or punk. It is a white powder, slightly soluble in water. Its formula is $C_{16}H_{30}O_5 + H_2O$. It is used as an anhidrotic (q.v.) in the night sweats of phthisis.

AGA′SIAS (Gk. Ἀγασίας). The name of two Ephesian sculptors, perhaps cousins, who lived at the beginning of the first century B.C. Agasias, son of Menophilus, made several statues of Romans on the island of Delos. Agasias, son of Dositheus, was the sculptor of the "Borghese Gladiator" found at Antium, and now in the Louvre. It probably represents a warrior on foot raising his shield, as if to guard against a mounted adversary. The figure seems derived from a group. It shows the characteristics of Asiatic art of the period.

AGASSIZ, ăg′ȧ-sē, *or* ȧ-găs′ĭz; *French pron.* ȧ′gȧ′sē′, Alexander (1835—). An American naturalist, capitalist, and philanthropist. He was born at Neuchâtel, Switzerland, December 17, 1835, the only son of Louis Agassiz. He joined his father in Boston in 1849, and graduated at Harvard College in 1855. He was made a bachelor of science by the Lawrence Scientific School in 1857; became assistant in the United States Coast Survey in California in 1859, and was assistant in the Museum of Comparative Zoölogy at Harvard College from 1860 to 1865. At this time he became interested in coal and later in copper mining, and assisted in the development of the Calumet and Hecla mines of native copper on the south shores of Lake Superior. These mines were then in an unproductive condition, but Agassiz, as superintendent, applied his extensive knowledge of geology, chemistry, and engineering, and so developed them that they have since yielded to him and his associates great wealth, which he has used to advance zoölogical research. After visiting different museums in Europe (1869-70), he was appointed curator (1874) of the Museum of Comparative Zoölogy, which his father had founded. He retained this position nominally until 1897, and was for some time a fellow of Harvard University. His chief interest has been in marine zoölogy, where his studies of invertebrate life, and especially of the development of polyps, jellyfishes, and echinoderms have placed him in the first rank of investigators. He explored Lake Titicaca and the coast of Chile during 1874-75, and founded in 1875 a private laboratory and salt water aquarium near his residence overlooking Narragansett Bay, at Newport, R. I. He superintended deep-sea dredging among the West Indies, in the United States steamer *Blake*, from 1877 to 1880, and in successive winters he has explored all the oceans, adding greatly to the knowledge of the fauna of the deep sea. His more important works are: *North American Acalephs* (1865); *Revision of the Echini* (1872); *North American Starfishes* (1877); *Report on the Echini of the Challenger Expedition* (1881); *Three Cruises of the Blake* (1888); *The Islands and Coral Reefs of Fiji* (1899). The latter includes a philosophical discussion of the whole subject of coral formations. He continued this line of work in 1901-02 by a private expedition to the Maldive Islands. Mr. Agassiz has given a million or more dollars toward furthering the study of zoölogy at Harvard University and elsewhere, always in an unostentatious way, and his abilities have been recognized by many universities and scientific societies in both Europe and the United States, where he is president of the National Academy of Science and of the American Academy of Arts and Sciences.

AGASSIZ, Elizabeth Cabot (Cary). (1822—). An American teacher and writer, born in Boston. In 1850 she was married to Professor Louis Agassiz, whom she accompanied to Brazil (1865-66), and on the *Hassler* expedition in 1871-72. Her publications include: *A First Lesson in Natural History* (1859); *Life of Louis Agassiz* (2 volumes, 1885), and *Seaside Studies in Natural History* (1865), in which she was assisted by her step-son, Alexander Agassiz. Mrs. Agassiz's home is at Cambridge, Mass. She is president of the Board of Control of Radcliffe College, and has taken an active part in promoting the interests of that institution.

AGASSIZ, Lake. See Lake Agassiz.

AGASSIZ, Louis (1807-73). An American naturalist, born at Motier, in the Canton of Fribourg, Switzerland. His father was a clergyman and his mother a woman of education and taste. Following a decided bent toward zoölogy, developed from childhood and fostered by his school preparation at Lausanne, he studied medicine and natural history at Zürich and Heidelberg, where he formed a lifelong and influential friendship with the botanist Alexander Braun. He studied also at Erlangen and at Munich, where he became acquainted with Martius and Spix, and when Spix died (1826), Agassiz prepared a description of his Brazilian fishes which attracted Cuvier's notice. After graduating in medicine and taking a degree in philosophy (1830), Agassiz studied in Paris under Cuvier, whose ardent disciple he henceforth was. From 1832 to 1846 Agassiz was professor of natural history at Neuchâtel, and there completed his first great work: *Recherches sur les poissons fossiles* (5 volumes, 311 plates, 1833-42). Several visits to England, beginning in 1834, enlarged his acquaintance and reputation, and gave material for his *Fossil Fishes of the Old Red Sandstone* of the British Isles. Next he turned to echinoderms, which he studied in both living and fossil forms. Another product of his labors at this period was the *Nomenclatoris Zoölogici Index* (Soloduri, 1842-46), of which a practical revision, bringing the lists of genera up to 1882, was made by Scudder and published as Bulletin No. 19, United States National Museum (Washington, 1882). From 1836 to 1845 Agassiz spent his summers in examining the glaciers of the Alps, often in company with A. Guyot, and illuminated and confirmed previous generalizations in respect to a former glacial epoch. In 1846 Agassiz was invited to the United States to give a series of lectures in the Lowell Institute course at Boston. These at once established his reputation as a lecturer, and led to his appointment, in 1848, as professor of natural history in the Lawrence Scientific School of Harvard University, which chair he held, except a brief interval at Charleston, S. C., until his death, although he relinquished teaching long before that event. Agassiz came to America untrammeled, and undertook the mission of teaching and advancing the cause of science in the United States with the utmost enthusiasm. His wife had died, but he presently remarried (see Agassiz, E. C.), and Mrs. Agassiz established in their house in Cambridge a school for girls, with which Professor Agassiz was identified. He traveled widely and lectured in various cities, and in 1848 visited the Lake Superior region with a class of scientific students. This exploration was described in a narrative by Cabot, to which Agassiz contributed chapters on fishes. Similarly, he undertook, in 1850-51, a study of the Florida coral reefs, the results of which were set forth in lectures and in articles contributed to the *Atlantic Monthly*, and subsequently gathered into two popular books, *Methods of Study in Natural History*, and *Geological Sketches*. He was everywhere and foremost a teacher, interpreting his facts and theories with such enthusiastic force and persuasive eloquence that he was in constant demand. A series of lectures which he delivered in Brooklyn in 1862 were epoch-making in this direction. They were republished in book form as *The Structure of Animal Life* (New York, 1874). Many of his views were in advance of popular knowledge and opinion and contravened some established religious tenets; yet he rarely excited serious opposition, and no educational influence of his time was so great as that exerted by him. He may be said to have realized at this period the ambition which he expressed in a letter to his father in 1829: "I wish it may be said of Louis Agassiz that he was the first naturalist of his time, a good citizen and . . . . beloved of those who knew him."

In 1858, the plans were laid for the great Museum of Comparative Zoölogy at Cambridge, Mass., now one of the most extensive and scientifically useful in the world; and for many years his main efforts were directed to building it up. He secured public appropriations and private gifts for it by his personal influence, and kept himself poor by his unselfish labors and liberality toward it. He gathered about him there and trained a body of men who have made for America a creditable record in biology—Alexander Agassiz, his son; J. A. Allen, H. J. Clark, S. Garman, Alpheus Hyatt, D. S. Jordan, E. S. Morse, A. S. Packard, F. W. Putnam, N. S. Shaler, A. E. Verrill, and others.

In 1865 he visited Brazil with his wife and a body of assistants. The results of these researches he published in his book, *A Journey in Brazil* (Boston, 1868). In 1872 he made a trip to California. In the summer of 1873 he held the first session of a summer school at the island of Penikese in Buzzard's Bay. This set an example that has led to the many summer schools and seaside laboratories since established in all parts of the country. During all these years he was prosecuting a continuous work on a great scale, entitled *Contributions to the Natural History of the United States*, of which four magnificent quarto volumes were published, the first, *An Essay on Classification*, in 1857, the others (monographs of American turtles and acalephs) soon after. The doctrine taught in these was a liberal advance upon the "special creation" views previously in vogue; yet when the Darwinian school of evolutionists arose they found in Agassiz a most earnest opponent, and it was a great grief to him to see that his scientific disciples were almost, without exception, becoming adherents to the new ideas. To stem this tide of scientific heresy, Professor Agassiz prepared and delivered in Cambridge, in the spring of 1873, a course of six lectures, which attracted very wide attention. This was his final public work, for late in 1873 he was attacked by brain disease, and died on December 14. He was buried with extraordinary honors in Mount Auburn Cemetery. His monument is a boulder brought from the glacier of the Aar, where he had made his most enlightening studies of glacial phenomena. Consult: Agassiz, *Life and Correspondence of Agassiz* (Boston, 1886); Marcou, *Life, Letters, and Works of Agassiz* (New York, 1896); Guyot, *Memoir of L. Agassiz* (Princeton, N. J., 1883), and Gilman and other eulogists, *Proceedings California Academy of Sciences*, Volume IV., 1873-74 (San Francisco, 1874).

AGASSIZ, Mount. An extinct volcano in Arizona, 70 miles northeast of Prescott, and 10,000 feet above the sea level. Another peak of this name in Utah is 13,000 feet high.

AGASSIZ ASSOCIATION. An organization to promote the study, collection, and preservation of natural objects by young people. It was formed in 1875 by Harlan H. Ballard and for a number of years grew rapidly, establishing branches throughout the United States and in many foreign countries. Up to 1906 the total membership, including those who have taken courses by correspondence in botany, mineralogy, and chemistry, has exceeded 30,000. The society has enrolled and assisted more than 20,000 students. The activity of the association was materially affected by the failure of the official organ, *The American Boy*, and in 1906 the membership was very small.

AG′ATE (Lat. *achates*, Gk. ἀχάτης, *achatēs*, so named, according to Pliny (*Hist. Nat.*, 37, 10, 55), from the Sicilian river Achates, where it was first found). A mineral composed of layers of quartz, generally of different colors, but intimately joined together and found chiefly of three varieties, in which the colors are, respectively, banded, or in clouds, or are produced by visible impurities, the last named giving rise to moss-agate, in which the black markings are due to manganese oxide. Agates are found universally, and are much used, when cut and polished, for ornaments and jewelry. The principal supply comes from Uruguay and Brazil, in South America, whence they are sent to Oberstein, in Germany, where their polishing is an important industry.

AGATE SHELL, or **AGATE SNAIL.** Any land-snail of the genus Achatina (family Achatinidæ), of which many species are to be found throughout tropical Africa. They are carnivorous, tall-spired, usually tinted and banded in bright colors, and include the largest land-shells known, some being ten inches long, producing eggs an inch in length, with a calcareous shell. See Plate of ABALONE, ETC.

AG′ATHA, SAINT. According to the legend, a noble Sicilian virgin of great beauty and wealth, who rejected the love of the consul Quintianus, and suffered a cruel martyrdom in the persecution of Sicilian Christians. She holds a high rank among the saints of the Roman Catholic Church. Her day falls on February 5. She is the patroness of the island of Malta, and there are churches erected in her honor. It is uncertain whether she ever lived, and if so, whether she died in the Decian persecution (251), or the Diocletian, fifty years later. Legend says that several times the mere carrying in procession of her veil, taken from her tomb in Catana, has averted eruptions from Mount Etna from the walls of that city, and that her intercession saved Malta from Turkish conquest in 1551. Consult: A. Butler, *Lives of the Saints*, under February 5 (London, 1847).

AG′ATHAR′CHUS (Gk. ’Αγάθαρχος, *Agatharchos*) (480? B.C.). A Greek painter; said to have been the first scene-painter, and therefore of importance as rendering perspective, in opposition to the school of Polygnotus. He is said to have left a treatise on this subject.

AGA′THIAS (Gk. ’Αγαθίας) (530?-580?). A Greek poet and historian, surnamed Asianus. He was educated at Alexandria and Constantinople; studied Roman law and practiced with success. He wrote love verses and made an anthology of earlier poets; but his most valuable work is a history of the years 552 to 558, in which he tells of the overthrow of the Ostrogothic power in Italy by the Byzantines, of the earthquakes of 554 and 557, the beginning of the Greek and Persian war, the rebuilding of St. Sophia, etc. This work was edited by L. Dindorf in *Historici Græci Minores* (Leipzig, 1871). Consult: Krumbacher, *Geschichte der byzantinischen Litteratur* (Munich, 1897).

AG′ATHO, SAINT. Pope from 678 to 685. He was a native of Palermo, Sicily, and is remembered chiefly for his efforts in bringing about the Sixth Ecumenical Council, which assembled at Constantinople in 680, and condemned the Monothelite heresy. His festival is celebrated on February 20 by the Greek Church, and on January 10 by the Roman Church.

AGATH′OCLES (Gk. ’Αγαθοκλῆς) (361-289 B.C.). A Sicilian despot, ruler of Syracuse. He was born at Thermæ, in Sicily; rose from humble circumstances through the patronage of Damas, a noble citizen of Syracuse, and received a command in the expedition against Agrigentum. Afterward he married the widow of Damas, and became one of the most wealthy men in Syracuse. Under the rule of Sosistratus he was obliged to flee into lower Italy, where he collected a band of partisans. Returning to Syracuse after the death of Sosistratus, he secured the supreme power in 317 B.C., strengthened his position by a massacre of several thousand respectable citizens, and took possession of the greater part of Sicily. To establish his power and keep his army employed, he now attempted to expel the Carthaginians from Sicily; but in this undertaking he was defeated. His next plan was to pass over to Africa with a part of his army and there to attack the Carthaginians. This war he carried on with success for more than three years, or until 307 B.C., when disturbances in Sicily compelled him to leave the army for a time. On his return to Africa he found his troops in a state of mutiny against his son, whom he had left in command, but pacified them by promises of large booty. Soon afterward he suffered a serious defeat, and with deliberate treachery left his own son exposed to the vengeance of the disappointed soldiers. The son was put to death, and the troops surrendered themselves to the enemy, while Agathocles escaped safely into Sicily, where, by fraud and cruelty, he soon recovered his former power, and was afterward engaged in predatory inroads into Italy. It was his intention to leave the throne to his youngest son, Agathocles; but his grandson, Archagathus, made an insurrection, slew the royal heir, and persuaded Mænon, one of the favorites of the aged tyrant, to destroy him by means of a poisoned toothpick. This took place in 289 B.C., when Agathocles was seventy-two years old and had reigned twenty-eight years.

AG′ATHON (Gk. ’Αγάθων) (447?-401? B.C.). An Athenian tragic poet. He gained his first victory at the Lenæan festival, in 416 B.C., and this victory is celebrated in Plato's *Symposium*. He was well-to-do and had many friends, among whom were Euripides and Plato. His style was flowery and ornate rather than strong or sublime, and his works were full of the rhetorical figures which marked the style of Gorgias. Still, after Æschylus, Sophocles, and Euripides, he was the most important tragic poet of Greece. According to Aristotle, he began the practice of making the chorus songs mere interludes, disconnected in theme from the dialogue. He is ridiculed in Aristophanes' *Thesmophoriazusæ*. About thirty short fragments of Agathon are preserved.

AGATHON. A philosophical novel by Wieland (q.v.), published in 1766. Its hero (Agathon) is a Platonist, and the theme is the proper mean in human life between asceticism and sensuality.

AG′ATIZED WOOD. See CHALCEDONY; and FOSSIL FORESTS.

AGAU, ȧ-gou′. An Hamitic people of Abyssinia, supposed to represent the aboriginal inhabitants of the highlands. The Agau tribes are scattered in various parts of the kingdom, one district, in Amhara, southwest of Lake Tsana, being called Agaumeder. The Agau language is widely diffused among the common people of Abyssinia.

AGAVE, ȧ-gä′vē (Gk. fem. of ἀγαυός, *agauos*, noble, high-born), CEN′TURY PLANT. A genus of plants belonging to the natural order Amaryllidaceæ, and having a tubular perianth with a six-partite limb, and a coriaceous, many-seeded capsule. They are herbaceous plants, of remarkable and beautiful appearance. There are a number of species, all natives of the warmer parts of America. By unscientific persons they are often confounded with Aloes (q.v.); and Agave Americana is generally called American Aloe. The agaves have either no proper stem, or a very short one, bearing at its summit a crowded head of large, fleshy leaves, which are often spiny at the margin. From the midst of these shoots up the straight, upright scape, sometimes 20 feet high, and at the base several inches in diameter, along which are small, appressed, lanceolate bracteæ, with a terminal panicle, often bearing as many as 4000 flowers. In South America these plants often flower in their eighth year, but in hot-houses not until they have reached a very advanced age; whence arises the gardeners' fable of their flowering only once in a hundred years. After flowering, in some species, the plant dies down to the ground, but the root sends up new shoots. The best known species is Agave Americana, which was first brought from South America to Europe in 1561, and being easily propagated by suckers, is employed for fences in Italian Switzerland, and has become naturalized in Naples, Sicily, and Northern Africa. By maceration of the leaves, which are 5 to 7 feet long, are obtained coarse fibres, which are used in America, under the name of *maguey*, for the manufacture of thread, twine, ropes, hammocks, etc. It is also known as Pita flax. It is produced to some extent in southern Europe. It is not very strong or durable, and if exposed to moisture soon decays. The ancient Mexicans employed it for the preparation of a coarse paper, and the Indians use it for oakum. Another species, Agave Mexicana, is particularly described by Humboldt on account of its utility. When the innermost leaves have been torn out, a juice flows for a considerable time, which, by inspissation, yields sugar and which when diluted with water and subjected to four or five days' fermentation becomes an agreeable but intoxicating drink, called *pulque*. Pulque is also produced from a number of other species, especially from Agave atrovirens, and a distilled liquor, *mescal*, is a product of species of this plant. Agave rigida sisalana, a native of Yucatan, yields an important fibre which, under the name of Sisal hemp, is extensively used for cordage. Consult: Englemann, *Botanical* Works (Cambridge, Mass., 1887); A. Isabel Mulford, *The Agaves of the United States* (St. Louis, 1896); Academy of Science, St. Louis, *Transactions* (St. Louis, 1875).

AGAVE. The mother of Pentheus (q.v.), whom, according to the Greek legend, she and other frenzied Bacchantes tore in pieces for opposing the new orgies of Dionysus. She was the daughter of Cadmus and the wife of Echion.

AGAWAM, ăg′ȧ-wäm. A town in Hampden County, Mass., two miles southwest of Springfield, on the Connecticut River (Map: Massachusetts, B 3). The distilling of gin and the manufacture of woolen goods and paper are the principal industries. Agawam was settled in 1635 and was incorporated in 1854. It was the scene of some fighting during King Philip's War and Shays's Rebellion. Population in 1900, 2536; in 1905, 2795.

AGDE, ȧgd. An ancient French town in the department of Hérault, on the river Hérault, two and a half miles from the Mediterranean Sea (Map: France, K 8). To the north, under the walls of the town, flows the Languedoc Canal. Agde has trade communication with Italy, Spain, and Africa, but its chief activity is in its coasting trade. It carries on a large traffic in coal, wine, oil, grain, silk, etc., and manufactures soap and verdigris. The general aspect of the place is sombre, on account of the black volcanic rock of which the houses are built and with which the streets are paved. Its most conspicuous building is the Cathedral of St. Étienne, Agde having been the seat of a bishopric since the beginning of the Middle Ages. The town was founded by the Greeks of Massilia, and its first name was Agathe. Pop., 1896, 7007; 1901, 9533.

AGE. A term employed to designate successive epochs in the history of the human race. In the Greek mind, the life of the race was likened to that of the individual—hence the infancy of the former might easily be imagined to be, like that of the latter, the most beautiful and serene of all. Hesiod mentions five ages—the Golden, simple and patriarchal; the Silver, voluptuous and godless; the Brazen, warlike, wild, and violent; the Heroic, an aspiration toward the better; the Iron, in which justice, piety, and faithfulness had vanished from the earth, the time in which Hesiod fancied that he himself lived. Ovid closely imitates the old Greek, except in one particular—he omits the Heroic Age. This idea, at first perhaps a mere poetic comparison, gradually worked its way into prose, and finally became an element of scientific philosophy. These ages were regarded as the divisions of the great world-year, which would be completed when the stars and planets had performed a revolution round the heavens, after which destiny would repeat itself in the same series of events. Thus mythology was brought into connection with astronomy. The Golden Age was said to be governed by Saturn; the Silver, by Jupiter; the Brazen, by Neptune, and the Iron, by Pluto. Many curious calculations were entered into by ancient writers to ascertain the length of the heavenly year and its various divisions. The greatest discrepancy prevailed, as might naturally be expected; some maintaining that it was 3000, and others as many as 18,000 solar years.

The Sibylline Books compared it to the seasons of the solar year, calling the Golden Age the spring, etc.; and, on the completion of the cycle, the old order was renewed. The idea of a succession of ages is so natural that it has inwrought itself into the religious convictions of almost all nations. It is sanctioned by Scripture, for it is symbolically adopted in the Apocalypse to a certain extent; it also manifests itself in the sacred books of the Hindus. Modern philosophy, at least in Germany and France, has also attempted to divide human history into definite ages or periods. Fichte numbers five, of which he conceives that we are in the third; Hegel and Auguste Comte reckon three, placing us in the last. Modern anthropology divides the prehistoric period of man into the older and newer Stone Ages (Paleolithic and Neolithic) and the Bronze Age. Stone and bronze are here not figurative, as in Hesiod's classification, but are indications of the state of man's civilization. In reference to this and other ages, as defined in science, see GEOLOGY, etc.

AGE. In law, that period of life at which persons emerging from infancy become capable of exercising the rights or become subject to the obligations and penalties of normal persons. As these rights and obligations vary greatly, the age of capacity may vary according to the right or obligation in question. Full age is the period at which a person acquires full legal capacity, and, in England and the United States, is usually fixed by law at twenty-one years, for men and women alike. This is considered to be attained on the day preceding the twenty-first anniversary of birth. In a few States, however, a woman comes of age at eighteen. Political capacity is usually coincident with the attainment of legal capacity, though greater maturity is usually required in this country of the holders of certain important offices of State. Thus, while one may become a member of the British Parliament at twenty-one, no one can be a representative in Congress until he is twenty-five, or a senator of the United States until he is thirty, nor become President before attaining the age of thirty-five.

Short of full age, a male minor may become capable of military service at eighteen (*military age*), and become capable of consenting to marriage and the choice of a guardian at fourteen (*age of discretion*). At common law the age of discretion for female infants was twelve, and the age of consent to unlawful carnal intercourse was ten, but recent legislation in the United States has raised the age of consent to fourteen, fifteen, sixteen, and, in several States, including New York, to eighteen years. (See CONSENT; RAPE.) The term 'age of discretion' is also more commonly employed to designate the period (usually the age of fourteen) at which persons become subject to criminal liability, an infant under seven years of age being deemed incapable of crime, and one between seven and fourteen being presumed to lack the discretion which such liability assumes; but this presumption is capable of being rebutted by proof. (See INFANT; CONTRACT; CRIME; MILITIA.) For the modern law of infancy consult Schouler, *Treatise on the Domestic Relations* (Boston, 1870).

AGE, CANONICAL. The age which, according to the canons, a man must have reached for ordination. This, in the Roman Catholic Church, is 22 for the sub-diaconate, 23 for the diaconate, 25 for the priesthood, and 30 for the episcopate. Dispensations may, however, be granted from this rule. In the Greek Church the age is 25 for a deacon, 30 for a priest or bishop; in the Anglican Communion 23 for a deacon and 24 for a priest.

AG'ELA'DAS (Gk. 'Αγελάδας) (520-?460 B.C.). An early Greek sculptor, born at Argos. He is now chiefly noted for having been the teacher of the famous artists, Myron, Phidias, and Polyclitus (q.v.). By him, however, were modeled the statues of Zeus and Hercules, as well as of various victors in the Olympian games, and Pausanias mentions numerous works of his. None of them, so far as known, has come down to us.

AGEN, à'zhäN'. The capital of the department of Lot-et-Garonne, France. It is situated in a fertile region on the right bank of the Garonne, 37 miles from Bordeaux (Map: France, G 7). The town is very ancient, and was founded during the Roman occupation, when it was known as Aginnum. It is the seat of a bishopric, and the cathedral dates from the days of Clovis. There is a fine stone bridge over the Garonne, and a still more beautiful structure is the aqueduct bridge of the Canal Latéral. Among monuments of note is a statue of the poet Jasmin. Its public institutions include a seminary for the training of the clergy and a library of 20,000 volumes. Standing between Bordeaux and Toulouse, Agen interchanges trade with both these places, and has, besides, several important home industries. The prunes of Agen are celebrated, and it also produces cotton, woolen, and linen fabrics of the first quality. Agen is the birthplace of Joseph Scaliger, Lacépède, and Bory de St. Vincent. Pop., 1901, 22,482.

AGENCE HAVAS, à'zhäN' sà'và'. See HAVAS AGENCY.

AGEN'DA (Lat., things to be done, from *agere*, to do). A term applied by theologians to practical duties as distinguished from the credenda, things to be believed, or doctrines that must be accepted as articles of faith. Among writers of the ancient Church the term signified both divine service in general and the mass in particular. We meet with *agenda matutina* and *vespertina*, morning and evening prayers; *agenda diei*, the office of the day; *agenda mortuorum*, the service of the dead. It is also applied to Church books compiled by public authority, prescribing the order to be observed by the ministers and people in the ceremonies and observances of the Church. In this sense agenda occurs for the first time in a work of Johannes de Janua about 1287. The name was especially used to designate a book containing the formulæ of prayer and ceremonies to be observed by the priests in their several ecclesiastical functions. It was generally adopted by the Lutheran Church of Germany, in which it is still in use, while in the Roman Church it has been, since the sixteenth century, supplanted by the term ritual (q.v.).

AGENOR, à-jē'nôr (Gk. 'Αγήνωρ). Originally a mythical personage in the Argive legends, and later said to have been a king in Phœnicia or Egypt, son of Poseidon, and father of Europa, Cadmus, Phœnix, and Cilix. When Europa was carried off by Zeus, Agenor sent his sons in search, with orders not to return without their sister. As she was not found, Cadmus founded Thebes, and the other sons settled in the countries which bore their names. See CADMUS.

A'GENT (Lat. *agens*, acting, pres. part. of *agere*, to act). A modern term in English law. As a generic term, it includes every one authorized to act for and represent another; but it is often used in a specific sense to denote one authorized to act for another in making contracts between that other, called the principal, and third persons. Blackstone does not employ it, and it rarely occurs in law dictionaries, digests, or decisions before the nineteenth century. For a time after its appearance it is used interchangeably with the word servant. During the last century, however, the tendency of judges and law writers has been toward a complete differentiation of the terms "agent" and "servant." A fair illustration of the result is afforded by the following provisions of the California Civil Code: "An agent is one who represents another, called the principal, in dealings with third persons." "A servant is one who is employed to render personal service to his employer, otherwise than in the pursuit of an independent calling, and who in such service remains entirely under the control and direction of the latter, who is called his master." Using "agent," then, to denote a person authorized to act for and represent another in business transactions with third persons, and reserving the rules relating to *master and servant* (q.v.) for a separate article, let us consider, (1) how agency is constituted, (2) the liability of the principal to third parties, (3) the liability of the agent to third parties, (4) the liabilities of principal and agent to each other, (5) the termination of agency.

(1.) Ordinarily, the relation of principal and agent originates in a *contract* (q.v.) between the parties, but it may exist without a contract, as where A gratuitously undertakes to do an act for B. The relationship may rest upon ratification, instead of a precedent agreement. For example: A does an act avowedly as B's agent, without authority from B. The act does not bind B, unless he accepts it as done on his behalf. If he does so accept it, his ratification is equivalent in law to a precedent appointment of A as agent. Even without appointing A or ratifying his acts, B may become liable for those acts, because his conduct induces third parties to believe that A is B's agent. In such a case there is agency by *estoppel* (q.v.). Still another form of agency is that which is created by the law, as where the law authorizes a wife to pledge her husband's credit for necessaries. In the language of a learned judge, "the law creates a compulsory agency, and her request is his request."

(2.) A principal who has authorized an agent to do an act for him, or has ratified the act, is liable to third persons preciselv as if the act had been done by him. As a rule, the principal is disclosed to the third party, and the latter understands that the transaction is between them, the agent being a mere conduit for the transmission of the principal's consent. But even though the principal is not disclosed, nay, even though the third party may refuse to enter into a transaction with the principal and may insist upon contracting with the agent as a principal, yet upon discovering that the transaction was for the principal's benefit and authorized by him, the third party may hold the principal liable. To this extraordinary liability of an undisclosed principal there are sundry limitations. If the third party has taken a written contract under seal or negotiable paper, duly executed by the agent in his own name, he cannot sue the principal on that instrument, because technical law permits only the parties to such a writing to be sued on it. Again, the third party may lose his right of action against an undisclosed principal by a final choice or *election* (q.v.) to hold the agent only; or by undue delay in proceeding against the principal. The principal may be liable to third parties for his agent's acts which he has never authorized, or which he has even forbidden. His liability in such cases depends upon whether the acts were done within the scope of the agent's apparent authority; for the principal will not be allowed to show that he secretly forbade what he appears to have authorized. What is the scope of an agent's authority depends upon the facts of the particular case, including ordinary business usages relating thereto. As the agent is, in law, a mere conduit of the principal's will, and thus identified with the principal, knowledge acquired by, or notice given to, the former during his agency, at least, is imputed to the latter. An exception to this rule exists where the agent acquires the knowledge or receives the notice in a transaction conducted by him in fraud of the principal. In such a case the agent cannot be expected to disclose his knowledge to the principal, and the legal fiction that the principal and agent are but one person will not be pressed so far as to work palpable injustice. It should be noted in this connection that when an undisclosed principal is liable to be sued by the third party, he is entitled, as a rule, to sue. This correlative right, however, he will not be allowed to enforce to the third party's injury. For example: any defense which the third party could have set up, had he been sued by the agent, he can interpose to an action by the principal.

(3.) An agent who discloses his principal incurs no liability to third parties if his acts are authorized or ratified and are lawful. From liability for unlawful acts he cannot screen himself by proving an express command of his principal, although such command renders the latter liable also. Every wrong-doer is personally responsible for his misfeasance. An agent will render himself liable on a written contract under seal, or on a negotiable instrument, if he executes it in his own name, although he intends to bind his principal thereby. In order to bind the principal, such an instrument must be in his name, and purport to be his deed, or note, or bill. In the case of other written contracts, the agent who discloses his principal will not be bound, unless the intention of the parties that he should be bound is apparent from the writing and attendant circumstances. The agent may render himself liable to the third party by assuming to act for a principal without authority.

(4.) In the absence of express stipulations in the contract to the contrary, the principal is under obligation to compensate the agent for his services; to reimburse him for all proper expenditures on the principal's behalf, and to indemnify him against the consequences of authorized acts which he did not know, or which he was not bound to know, were unlawful. On the other hand, the agent is under obligation to act with the utmost good faith toward the principal, obeying his instructions, advancing his interests, and rendering full and true accounts of all transactions. An agent cannot delegate his authority to another, so as to escape responsibility to the principal for that other's acts, without the express or implied assent of the principal. Nor, ordinarily, will a principal be bound by the acts of a sub-agent whose employment he has not authorized or ratified.

(5.) Agency may be terminated by the agreement of the parties, or by the principal's revocation of the appointment, or by operation of law. If terminated in either of the first two ways, notice must be given to those who have been accustomed to deal with the agent, or the latter will still be able to subject the principal to liability to such persons; for, until notice of revocation, these have a right to suppose that the relation of principal and agent continues. The death of either principal or agent, and the bankruptcy of the principal, furnish the most common examples of termination of agency by operation of law, and such termination is effective without notice. An agency which is "coupled with an interest" (i.e., a vested property right) in the subject-matter of the agency is revocable only by the mutual assent of both parties.

Doctrines peculiar to special classes of agents are dealt with under the appropriate headings, e.g., ATTORNEY; AUCTION; BROKER; PARTNERSHIP; FACTOR; CRIME. Consult: Evans, *Principal and Agent in Contract and Torts* (2d ed., London, 1888); Huffcut, *Law of Agency* (Boston, 1901); Story, *Commentaries on the Law of Agency* (9th ed., Boston, 1882).

AGE OF IN'NOCENCE. A celebrated painting by Sir Joshua Reynolds in the National Gallery, London. It depicts a little girl sitting on the ground before a group of trees.

AGE OF REA'SON. The name given to a certain phase and period of the French Revolution when Christianity was decried, Reason proclaimed as the only true deity, and bishops exchanged their mitres for liberty caps. This movement was fomented by Hébert (q.v.) and his followers, professed atheists, who succeeded in persuading many Christians to renounce their faith. The worship of Reason centred around the ceremonies held in her honor at Notre Dame, November 10, 1793. The Goddess of Reason, typified by a painted harlot, was placed on the altar and received the homage of her adorers. A schism in the party of the Montagnards, to which the atheists belonged, led to their execution, March 24, 1794. However, it was not till June 8, 1794, that France, in the Feast of the Supreme Being, officially received again religion, at the hands of Maximilien Robespierre.

AG'ESAN'DER (Gk. 'Αγήσανδρος, *Agēsandros*). A Greek artist of the school of Rhodes. In conjunction with Athenodorus and Polydorus he executed the celebrated group of Laocoön, which was discovered near the baths of Titus in the sixteenth century. The time of Agesander is unknown, but there is reason to believe that he was a contemporary of Vespasian.

AGES'ILAN OF COL'CHOS. The title and hero of one of the romances in *Amadis of Gaul* (q.v.), Books XI. and XII.

AGES'ILA'US (Gk. 'Αγησίλαος, *Agēsilaos*) (c.444-360 B.C.). King of Sparta about 401-360 B.C. He was the son of Archidamus II. and succeeded Agis II., Leotychides, the son of Agis, being set aside through the influence of Lysander, on the ground of illegitimate birth. In 397 B.C. he was sent to Asia Minor as commander-in-chief of the Spartan forces in the war with Persia. He carried on the war with success, and was preparing to advance into the interior of the country, when in 394 B.C. he was called back to Greece to make head against the coalition which had been formed by Thebes, Athens, and other Grecian States against the power of Sparta. Proceeding by land, he arrived in Greece about a month later, and in the same year defeated the allies at Coronea. In the years that followed, Agesilaüs took an important part in his country's politics and campaigns. In 361 B.C. he undertook an expedition to Egypt, but while on his way home died, in the winter of 361-360, in his eighty-fourth year and the forty-first year of his reign. Agesilaüs was small of stature and lame. He was simple in dress and in his way of living; blameless in public and private life alike; a patriot, though a party man; a conservative in politics; a successful, though not a great, general.

AGGLU'TINATE LAN'GUAGES (Lat. *ad*, to + *gluten*, glue, paste). One of the chief linguistic groups, characterized by postpositional elements added to roots. These suffixes, ultimately losing their distinct meanings, become integral components of the words, thus forming the transition to inflection (q.v.). The chief families of agglutinate languages are Ural-Altaic (including Finnish, Turkish, and Hungarian), Dravidian (spoken in southern India), Tibeto-Burman (in Tibet, Siam, and Burma), and Malayo-Polynesian. (See PHILOLOGY; TURANIAN LANGUAGES). Consult: Friedrich Müller, *Grundriss der Sprachwissenschaft* (4 vols., Vienna, 1876-1888).

AG'GREGA'TION, STATES OF (Lat. *ad*, to + *gregare*, to collect into a flock). The three states, *gaseous*, *liquid*, and *solid*, in which matter occurs. Many substances are capable, under certain conditions of temperature and pressure, of existing in any of the three states. Water, for instance, may be gaseous (steam, or water vapor), liquid (as ordinarily), or solid (ice). Other substances, on the contrary, could, by the means at our disposal, be obtained in only one of the states of aggregation; thus, the element carbon remains solid even at the highest temperatures that can be produced at present, and many of its compounds undergo chemical decomposition before reaching the point at which they might melt.

Under certain conditions matter has been assumed to be capable of existing in other states besides the above three. Thus, Boutigny thought that liquids, when thrown upon glowing hot surfaces, pass into what he called the *spheroidal* state. Crookes thought that, at the instant of the electric discharge, the gases inclosed within a Crookes tube pass into a *radiant* state, which is characterized by certain properties not found in the other states of aggregation. When under the critical pressure and temperature (see CRITICAL POINT), substances are sometimes said to be in the *critical* state. In this article, however, only the three states of aggregation that are generally recognized may be briefly characterized.

1. A gas (or vapor) occupies the volume and assumes the shape of the vessel within which it is inclosed, and its resistance to a change of shape

is very small. The amount of work which must ordinarily be expended in diminishing the volume of a gas is also insignificant compared to that required in the case of liquids or solids. Another characteristic property of gases is their capacity of mixing with one another in all proportions. Gases may be said to be matter in a highly rarefied state, their specific gravity being ordinarily very small compared to that of liquids or of solids. According to the molecular theory, the distances between their particles are very great, and therefore the particles exert very little action upon one another. See MOLECULES—MOLECULAR WEIGHTS.

2. The volume of a liquid varies but little with the external conditions; very great pressures, for instance, will cause but a slight diminution of the volume of a liquid. Like gases, however, liquids have no shape of their own, and they readily assume the shape of the vessel containing them. Certain pairs of liquids (for instance, alcohol and water) are capable, like gases, of mixing in all proportions; others (for instance, carbolic acid and water) dissolve in each other to a limited extent; still others (for instance, carbon di-sulphide and water) are practically insoluble in each other. The molecules of a body in the liquid state are much nearer to one another than those of a gas, and consequently are capable of exerting upon one another considerable attraction.

3. In the case of solids, not only the volume, but also the shape, cannot be easily changed. Very little is as yet known of the molecular constitution of solids. Concerning the mutual solubility of solids, see SOLUTIONS and ISOMORPHISM. Consult: J. D. van der Waals, *La continuité des états gazeux et liquides* (in French, Paris, 1894; in German, Leipzig, 1899-1900).

A′GIAS (Gk. Ἀγίας). An ancient Greek cyclic poet of Trœzen, who lived about 740 B.C. His chief work was Νοστόι, *Nostoi*, or the *History of the Return of the Achæan Heroes from Troy*. Only fragments of the poem have been preserved.

AGIB, ä′gĭb. The name of two characters in the *Arabian Nights*. (1) In the *History of the Three Calendars*, the third calendar, whose marvelous adventures began with his shipwreck on the lode-stone mountain. (2) In *The Story of Noureddin Ali and Bedreddin Hassan*, the son of the latter.

AGINCOURT, à′zhäɴ′ko͞or′, or **AZINCOURT**. A village in the department of Pas-de-Calais, France, celebrated for the splendid victory over the French gained by Henry V. of England on St. Crispin's Day, October 25, 1415. Reviving the ancient claim of the Plantagenets to the French throne, Henry had invaded France and taken Harfleur; but disease and privations in his small army determined him to return to England for reinforcements. Setting out for Calais, he forded the Somme with great difficulty, only to find a French army of 50,000 men blocking his way. Henry offered advantageous terms, to save his 14,000 men from destruction; but the French were so confident of annihilating the weakened English troops that they would hear of nothing but absolute surrender. Between two woods, near the villages of Agincourt and Tramecourt, the English placed themselves, in sullen desperation. The French, mainly Armagnac soldiery and men-at-arms, were drawn up in two lines, cavalry in front, infantry behind. As the English marched forward, the enemy's cavalry, peers and knights of France, charged to meet them. But the loamy ground held their horses' feet, and the rain of English cloth-yard arrows poured upon rider and horse, broke the front rank, which in confusion retreated on the second line, breaking that too. The English archers, with billhook and hatchet, dashed in among the heavily encumbered men-at-arms and slaughtered them in great numbers, turning the fighting into a butchery. Those of the enemy who could, ran; the rest perished. The French nobility was almost annihilated in this battle; among the 10,000 dead being the Constable d'Albret, the commander of the French force, six dukes and princes, and numberless lords and knights of lesser degree. The English lost 1000 men, among them the Duke of York. Consult Nicolas, *History of the Battle of Agincourt* (London, 1833).

AGIO, ăj′ĭ-ō *or* ā′jĭ-ō. An Italian word, signifying "accommodation," first used in Italy to denote the premium taken by money-changers in giving gold for silver, on account of the greater convenience of gold for transport. The same word is now used in particular to denote the difference in the value of a metallic currency and the paper money representing it; also the variations from fixed pars or rates of exchange. It corresponds very nearly to the English word "premium."

AGIRA, ȧ-jē′rȧ, formerly SAN FILIPO D'ARGIRÒ. A city in Sicily, 2130 feet above the sea, 45 miles northwest of Catania (Map: Italy, J 10). It has the ruins of a Norman castle, sulphur mines, and marble quarries. The historian Diodorus (q.v.), who was born here, credits it with having been honored by a visit from Hercules, but now St. Philip has succeeded the heathen hero as the tutelary genius of the city. Four miles to the north is Gagliano, where 300 French knights were ambushed in 1300. Pop., 1901, 17,738.

A′GIS (Gk. Ἆγις). The name of several kings of Sparta. (1) Son of Eurysthenes and founder of the family of the Agidæ. According to one account, he conquered Helos and established the order of the Helots. (2) Son of Archidamus II., and king from 427 or 426 to 400 or 399 B.C. He was one of the best kings of Sparta and one of the most distinguished men of his time. He took an active part in the Peloponnesian War, several times invaded Attica, and defeated the Athenians and their allies at the battle of Mantinea, in 418 B.C. It was said that Alcibiades seduced Timæa, the wife of Agis, and in consequence of this report, Leotychides, Timæa's son, was excluded from the throne in favor of Agesilaüs. (3) Son of Archidamus III., and king from 338 to 331 B.C. He tried to overthrow the Macedonian power in Europe while Alexander the Great was in Asia, but was defeated and killed in battle by Antipater in 331 B.C. (4) Son of Eudamidus II., and king from 244 to 240 B.C. He tried to reëstablish the institutions of Lycurgus and reform the Spartan State, but, being opposed by the wealthy classes, was thrown into prison and put to death. Consult Plutarch, *Life of Agis* and Barran, *Histoire d'Agis IV.* (Paris, 1817).

AGIST′MENT (O. F. *agister*, Lat. *ad*, to + O. F. *gister*, to assign a lodging, from *giste*, Fr. *gîte*, an abode, resting-place). The common contract of bailment (q.v.), whereby a person (called the *agister*) pastures the horses or cattle of another. The agister is not subject to the extraordinary liability of the common carrier (q.v.) and the inn-keeper (q.v.) for the loss of the property intrusted to his care, but is, nevertheless, bound, as an ordinary bailee for hire, to take reasonable care of the animals. On the other hand, he is not, like the inn-keeper, the common carrier, the horse-trainer, etc., entitled to a lien (q.v.) on the animals for his charges. Consult: Sir William Jones, *Essay on the Law of Bailments* (New York, 1828); Story, *Commentaries on the Law of Bailments* (Boston, 1878).

AGLA′IA (Gk. *'Αγλαία*, splendor, beauty). According to Hesiod, the youngest of the three Graces, the wife of Hephæstus.

AGLA′OPHON (Gk. *'Αγλαοφῶν*). A Greek painter who lived about 500 B.C. He was the father of Polygnotus and Aristophon, also painters and his pupils. Quintilian praises Aglaophon's pictures for simplicity of coloring.

AGLAU′RA. A play by Sir John Suckling (q.v.), produced in 1637-38, and first published in 1638, in folio, and again in 1646. It is said that the King was present when the play was acted and was so distressed by its sad ending that the author wrote a new conclusion, making the piece a "tragi-comedy."

AGLIARDI, ȧ-lyär′dê, ANTONIO (1832—). Archbishop of Ferrara, and cardinal. He was born at Cologno and studied law and theology at Rome. In 1884 Pope Leo XIII. appointed him Archbishop of Cæsarea in Palestine, and shortly thereafter he was sent as the apostolical delegate to India to settle the Goa controversy with Portugal. In 1889 he was the Papal nuncio in Munich, and four years later filled the same position in Vienna. His personal interference with the ecclesiastical affairs of Hungary, in 1895, resulted in his receiving a public reprimand from the Hungarian government, in consequence of which a dispute arose between Bánffy, the president of the Hungarian ministry, and Kálnoky, the Austro-Hungarian minister of foreign affairs, which culminated in the downfall of the latter. He was appointed Archbishop of Ferrara and cardinal in 1896.

AGLOS′SA (Gk. *ἀ*, *a*, priv. + *γλῶσσα*, *glōssa*, tongue). A group of anurous amphibia, the frogs, without a tongue and with one pharyngeal opening of the Eustachian tubes. It contains certain fossil forms, but only two recent families, Pipidæ (South American) and Xenopidæ (African). See PIPA.

AGNANO, ȧ-nyä′nô. Formerly a small lake near Naples, Italy, situated in the crater of a volcano, now drained on account of its malarial influence. At the right of Lake Agnano lies the Grotto del Cane, whose floor is covered with a stratum of carbonic acid gas of sufficient strength and depth to kill small animals that are put into the grotto. On the left are situated the vapor baths of San Germano, used by people afflicted with rheumatism and gout. The volcanoes surrounding the lake have been extinct since 1198 A.D. Further on the left from Agnano lies the lake of Astroni, which occupies the crater of an extinct volcano and is surrounded by beautiful woodlands.

AG′NATE (Lat. *agnatus*, born in addition to, from *ad*, to + *natus*, born). Agnates, in the law of both England and Scotland, are persons related through the father, as cognates are persons related through their mother. By the English law of succession, agnates inherit unless the inheritance was received by the deceased person *a parte materna*, that is, from the mother, or a cognate, in which case it would descend, if he left no issue, to her cognates. In the Roman law, both of these terms had a somewhat different signification. Agnates, by that system, were persons related through males only, whilst cognates were all those in whose connection, though on the father's side, one or more female links intervened. Thus, a brother's son was his uncle's agnate, because the propinquity was wholly by males; a sister's son was his cognate, because a female was interposed in that relationship. The reason for having thus changed the meaning of terms manifestly borrowed from the Roman law seems to be that in Rome the distinction between agnates and cognates was founded on an institution which has not been adopted in the Roman sense by any modern nation—that, namely, of the *patria potestas* (q.v.). Roman *agnati* are defined by Hugo to be all those who either actually were under the same *paterfamilias*, or would have been so had he been alive; and thus it was that, as no one could belong to two different families at the same time, the agnation to the original family was destroyed and a new agnation created, not only by marriage, but by adoption (q.v.).

Justinian abolished entirely the distinction between agnates and cognates, and admitted both to legal succession. As to the legal effects of the distinction in the modern sense, see SUCCESSION: GUARDIAN. See the works referred to under CIVIL LAW.

AGNES (*Fr. pron.* ȧ′nyâs′). (1) In Molière's *L'Ecole des femmes*, a character who has become proverbial as a type of *ingénue*. She is a young girl brought up in ignorance of many of the social relations, who innocently makes the most suggestive remarks and without intention cruelly wounds other people's feelings. In English, Wycherley's *Mrs. Pinchwife* is in some respects patterned after her. (2) A character in Lillo's tragedy, *Fatal Curiosity*. (3) Agnes Wickfield, in Dickens's *David Copperfield*. See WICKFIELD, AGNES.

AG′NES, COUNTESS OF OBLAMÜNDE. See AGNES OF MERAN.

AGNES, SAINT. A Christian virgin, martyred in Rome by order of Diocletian when about thirteen years old. The legend is that her beauty excited the desires of wealthy suitors, who, vainly seeking her in honorable marriage, denounced her to the governor as a Christian. Unmoved, she heard threats of torture, and was sent to the public brothel, where only one, however, ventured to touch her, and he was stricken with miraculous blindness until his sight was restored in answer to her prayers. She was a little later beheaded. Her day is January 21, and her symbol is a lamb. Her legend resembles that of St. Agatha (q.v.). Consult: A. Butler, *Lives of the Saints*, under January 21 (London, 1847).

AGNES GREY. A novel by Anne Brontë, published 1847, under her pseudonym of Acton Bell.

AGNESI, ȧ-nyā′zê, MARIA GAETANA (1718-99). An Italian mathematician, born at Milan. Her family was prominent at Milan, and she had all the educational advantages that wealth could procure. Her linguistic and philosophic powers suggested the title of "oracle in seven languages." She also gave much attention to the sciences, particularly to mathematics. "Algebra and geometry," she said, "are the only provinces of thought where peace reigns." In 1748 she was made a member of the Academy of Bologna, and in the same year appeared her *Istituzioni analitiche ad uso della gioventù italiana*, 2 volumes (Milan, 1748; Paris, 1775; London, 1801). In 1750 she was appointed by Pope Benedict XIV. lecturer on mathematics at the University of Bologna. Early devoted to religious observances, after the death of her father (1752), she renounced her scientific work and took the veil. Her name is connected with an interesting cubic curve. Consult: J. Boyer, "La mathématicienne Agnesi," in the *Revue Catholique des revues françaises et étrangères* (Paris, 1897); and Antonio Francesco Frisi. *Elogio* (Milan, 1799; translated by Boulard, Paris, 1807).

AG′NES OF AUS′TRIA (1281-1364). A daughter of Albrecht I., Emperor of Germany. She was the wife of Andreas III., King of Hungary, and after the murder of her father (1308) lived at the monastery of Königsfelden, which her mother had erected upon the site of the assassination of the Emperor. She took an active part in the political events of the period, and frequently acted as mediator between Austria and the Swiss Confederacy.

AGNES OF MERAN, mȧ-rän′ (?-1201). A queen of France, daughter of the Duke of Meran (Tyrol) and Margrave of Istria. She was married in 1196 to Philip Augustus (q.v.), who had obtained (through the French bishops) a divorce from Ingeborg of Denmark. The Pope refused to allow the divorce, but the King braved the Papal wrath. In 1198 France was placed under an interdict; but in 1200, the King, by a feigned compliance, secured the raising of the interdict. Agnes died in 1201, but it was not until 1213 that Philip was reconciled to Ingeborg. Then the Pope legitimatized the two children of Agnes.

AGNES OF POITIERS, pwä′tyȧ′ (1025?-1077). A queen of Germany, daughter of William V., Duke of Aquitaine, and second wife of Henry III. of Germany, to whom she was married in 1043. She was much influenced by the ideas of Cluny. After the death of Henry (1056), Agnes became Regent of the Empire as guardian of her son, Henry IV. In 1062 rebellious nobles secured possession of the young Henry, and Agnes went to Italy. She became closely associated with Gregory VII. in his contest against Henry.

AGNES' EVE, SAINT. The night of January 20. In popular superstition it is regarded as an occasion when young women can by various magic arts behold the faces of their destined husbands.

AGNES SOREL′ (1421-50). The mistress of Charles VII. of France, and lady of honor to his queen, the virtuous Marie of Anjou, whose full confidence she long enjoyed. She had great influence over Charles, and at a period of the greatest degradation for France (see JOAN OF ARC), inspired him to action against the English invaders, which resulted in their expulsion from the country. Her death was sudden, and it is supposed that she was poisoned by the Dauphin, afterward Louis XI. She had three children by the king. Consult: Capefigue, *Agnès Sorel* (Paris, 1860).

AG′NEW, CORNELIUS REA (1830-88). An American physician. He was born in New York City, graduated from Columbia College in 1849, and from the College of Physicians and Surgeons in 1852. In 1858 he was appointed surgeon-general of New York State, and during the Civil War was medical director of the New York Volunteer Hospital. He was prominent in the United States Sanitary Commission. He assisted in founding the Columbia School of Mines in 1884, founded the Brooklyn Eye and Ear Hospital in 1868, and the Manhattan Eye and Ear Hospital. He became president of the State Medical Society in 1872, one of the trustees of Columbia College in 1874, and was a professor in the College of Physicians and Surgeons. He was a member of many medical and scientific societies, and contributed much to the literature of the diseases of the eye and ear.

AGNEW, DANIEL HAYES (1818-92). Professor of surgery at the University of Pennsylvania, and very widely known by his surgical inventions and by his writings, among which may be mentioned: *The Principles and Practice of Surgery*, 3 volumes (1878-83).

AG′NI (Skr. *Agni-s*). The fire god of the Hindus, corresponding in name to the Latin *ignis*, Lithuanian *ugnis*, and Old Slavic *ognĭ*, fire. Next to Indra (q.v.) he is the most prominent of the gods in the *Veda* (q.v.). No less than two hundred hymns celebrate his praise under his three-fold form, as the fire on earth, especially the altar-fire, the lightning in the sky, and the sun in heaven. His birth is of divine origin, as the lightning of the clouds, or he is daily produced by a miracle, the rubbing together of two sticks which are regarded as his parents, and he devours them as soon as he is born. Kindled each morning at the sacrifice, his worship forms one of the most important parts of the ritual. He is especially the messenger between the gods and men, and he rides upon a chariot drawn by two or more steeds. Although an immortal, he has taken up his abode among men, and he is regarded as the most honored guest. In the later literature less is made, perhaps, of Agni than in the early hymns; but as one of the most prominent gods several legends are preserved regarding him in the Hindu epics Mahābhārata and Rāmāyana (q.v.). The Harivanśa (q.v.) describes him as clad in black, with a banner of smoke and a javelin of flame. In pictures he is variously portrayed, but his color is red and he is represented as having two faces, which typify his destructive as well as his beneficent character, and he has three legs and seven arms. Sometimes he is represented as riding upon a ram or as accompanied by that animal. Consult: Macdonell, *Vedic Mythology* (Strassburg, 1897); Hopkins, *Religions of India* (Boston, 1895); Wilkins, *Hindu Mythology* (London, 1900).

AG′NOE′TÆ (Gk. *ἀγνοεῖν, agnoein*, to be ignorant). A Monophysite sect in the sixth century, which gave prominence to the statement that, in his human nature, Christ was ignorant of many things, especially of the time of the day of judgment. An Arian sect of the same name in the fourth century denied the omniscience of God.

AGNOLO, ä'nyō-lō, Baccio d'. See Baglioni.

AGNO'MEN (Lat. *ad*, to, in addition, + *nomen*, name). A term used by the ancient Roman grammarians to denote an additional personal name derived from some act, quality, or event; as *Cunctator*, given to Q. Fabius Maximus, *the Delayer;* Pliny *the Younger;* Scipio *Africanus*. But the Romans themselves regarded such a term merely as an additional *cognomen*. See Cognomen.

AGNONE, ȧ-nyō'nā. A city of southern Italy, 22 miles northwest of Campobasso (Map: Italy, J 6). It stands on a hill said to be the site of the Samnite *Aquilonia*. It has cloth, steel, and copper works. Pop., 1901, 9793.

AGNOS'TICISM (Gk. ἄγνωστος, *agnōstos*, unknown, unknowable, ignorant). A word coined by Professor Huxley to express the doctrine that man from his very nature is incapable of forming trustworthy conclusions concerning ultimate reality. The doctrine is by no means new. It is essentially one with the view of Protagoras (q.v.), that the individual man is the measure of the universe, and with the view of the Greek skeptics from Pyrrho onward. (See Ænesidemus.) Among English-speaking philosophers H. Spencer (q.v.) is the best known agnostic. The tenability of the agnostic position depends on the justifiability of the dualistic assumption that reality is independent of mind. It argues that knowledge is the result of a mental process which claims to represent an external reality; that to know this claim to be valid is possible only after a comparison of the representation with the original; but that the original is, *ex hyp.*, not an object of knowledge; hence, that no comparison is possible for the knower. Knowledge of reality is thus a huge undemonstrable assumption. For a criticism of agnosticism see Knowledge, Theory of; Absolute; Dualism, and Appearance.

AGNOS'TUS (Gk. ἄγνωστος, *agnōstos*, unknown). A characteristic Cambrian genus of blind trilobites distinguished by their small size, the elliptical form of the dorsal shield or carapace, the close resemblance of the head-shield (cephalon) and tail-shield (pygidium), and the presence of only two segments in the thorax. This genus, comprising over 150 species, is abundantly represented in the Cambrian formations of Scandinavia, Bohemia, Great Britain, Spain, and North America; indeed, certain kinds of Cambrian shales are filled with the detached fragments of the discarded moults of these crustaceans. A few species are, in northern Europe, known from the lowermost Ordovician beds. An allied genus, also characteristic of the Cambrian formations, is Microdiscus, with four thoracic segments, which seems to be a somewhat earlier form than Agnostus, and may perhaps be in a certain sense the ancestral form from which Agnostus was evolved. For illustration, see Trilobita. See also articles on Trilobita; Cambrian System.

AG'NUS, Felix (1839—). An American soldier and editor. He was born in Lyons, France, and fought in the war waged by Napoleon III. against Austria, and after the battle of Montebello was detailed to the celebrated flying corps under Garibaldi. He came to America in 1860, and enlisted in the Duryea Zouaves (New York Volunteers), upon the outbreak of the Civil War, and at the battle of Big Bethel saved the life of General Kilpatrick. He served as lieutenant-colonel under Sheridan in the latter's famous campaign in the Shenandoah Valley (1864), and toward the close of the war, as inspector-general in the Southern Department, he was commissioned to dismantle the Confederate forts in South Carolina, Georgia, and Florida. At the close of the war he was brevetted brigadier-general of volunteers (March 13, 1865), and soon afterward was retired from the service. He then became business manager of the Baltimore *American*.

AG'NUS DE'I (Lat., Lamb of God). One of the titles of Christ (John i. 29); also the name given to a certain prayer used in the Roman Catholic service of mass. The litanies generally conclude with the same prayer: "O Lamb of God, that takest away the sins of the world, have mercy upon us." The figure of a lamb bearing a cross, stamped upon an oval of wax, silver, or gold, is also styled an Agnus Dei. Such medals have been consecrated by the popes since the fourteenth century, and are generally distributed among the faithful on the first Sunday after Easter. In the ancient Church candidates for baptism received similar medals of wax and wore them as objects of devotion. In the Greek Church the cloth which covers the cup in the communion service bears the image of a lamb, and is styled the Agnus Dei.

AGON'IC LINES ("lines without angles," from Gk. ἀ, *a*, priv. + γωνία, *gōnia*, angle). Imaginary lines on the surface of the earth such that at each point through which one passes the magnetic declination is zero; that is, at such a point a magnetic compass needle lies in the geographical meridian, and hence points in a "true" north and south direction. There are two agonic lines at the present time (1902). One is a closed curve passing across Hudson's Bay, into the Atlantic Ocean east of Florida, across Brazil, through the Antarctic Ocean, near the south pole of the earth, northward through Australia, the Indian Ocean, Russia, near the north pole of the earth, and back again. The other is a much smaller closed curve, called the "Siberian Oval," because it is contained in Eastern Siberia and China. See Magnetism, Terrestrial.

AG'ONY COL'UMN. In England, a term applied to that part of a newspaper, generally the second column of the advertisement sheet, headed by notices of losses and disappearances, mysterious communications and correspondence, corresponding to the American *personal column*.

AGOO, ȧ-gō'ō. A town of Luzon, Philippines, in the province of La Union. It is situated on the western coast, about 19 miles south of San Fernando. Pop., 1903, 10,653.

AG'ORAC'RITUS (Gk. 'Αγοράκριτος, *Agorakritos*). A Greek sculptor of the fifth century B.C. He was born on the island of Paros, and was the favorite pupil of Phidias. His works are said to have been so perfect that the ancients were frequently uncertain to which of the two sculptors they should be ascribed. His chief creation was the colossal figure of Nemesis at Rhamnus, which he is supposed to have developed from his unsuccessful Aphrodite, prepared for the contest with Alcamenes. Fragments of the work were recently discovered at Rhamnus.

AGOSTA, ȧ-gŏ'stȧ, or **AUGUS'TA**. A walled city of Sicily, in the province of Syracuse, 12 miles north of that city. It stands on a peninsula, jutting into the Mediterranean, and is said to occupy the site of the Megara Hyblæa of the ancients. Agosta, founded by the Emperor Frederick II. in 1229, played an important part in the war of the Sicilian Vespers, withstanding Charles of Anjou until betrayed into the hands of William L'Estendard, one of his barons (1286). The city was then sacked and the inhabitants ruthlessly butchered, and many years passed before Agosta was repeopled or began to prosper. In 1551, Agosta was taken and burned by the Turks. Earthquakes destroyed the city in 1693, when one-third of the inhabitants perished, and in 1848. In 1676, a great naval battle was fought here between the Dutch under De Ruyter and the French. De Ruyter himself was killed. The port is spacious, but rather difficult of access. While salt is the chief article of export, oil, wine, cheese, fruit, honey, and sardines are also exported. Pop., 1901, 15,873.

AGOSTINO, ä′gō-stē′nō, and **AGNOLO**, ä′-nyō-lō. Architects and sculptors of Siena early in the fourteenth century. They have been erroneously called brothers, because they worked together; but Agostino was the son of Giovanni, and Agnolo the son of Ventura. They are supposed to have been pupils of Giovanni Pisano. Their sculptural masterpiece is the monument of Bishop Tarlati at Arezzo (1330). They erected several public buildings in Siena. They built in 1325 the great tower of the Palazzo Comunale at Siena, rivaling that of the Palazzo Vecchio at Florence, and in 1337 Agnolo erected the fortress of Massa.

AGOSTINO DI DUCCIO, dē dōō′chō (1418-81). A Florentine sculptor and architectural decorator, one of the foremost artists of the middle early Renaissance. He executed at twenty-three a series of reliefs for the cathedral of Modena (1442). He fled from Florence in 1446, and was secured by Alberti for the sculptural decoration of the interior of San Francesco at Rimini, some parts of which, such as the tomb of Sigismundo Malatesta, are masterly. But his full capacity was shown in his next work, the façade of San Bernardino at Perugia, one of the finest pieces of Renaissance sculpture composition. His style was sometimes mannered and often incorrect. His forte was very low relief with evanescent effects, poetic female figures, and decorative composition. He returned to Florence after 1463, and his latest works show continued progress, such as the "Madonna" in the Opera del Duomo.

AGOULT, á′gōō′, Marie Catherine Sophie de Flavigny, Comtesse d' (1805-76). A French author, whose pseudonym was Daniel Stern. She was born at Frankfort-on-the-Main, but was educated at Paris, where, in 1827, she married Count d'Agoult. Afterward she lived with Franz Liszt, and of her two daughters by him the youngest was married to Richard Wagner. After a series of novels, including *Hervé* (1841), and *Nélida* (1845), she published several political works, of which the best known are *Lettres républicaines* (1848), criticising the government of Louis Philippe, and the *Histoire de la Révolution de 1848* (3 volumes, 1851-53). Her best work is *Esquisses morales et politiques* (1849), a volume of political and moral aphorisms in the style of the *Maximes* of Rochefoucauld. Though her moral laxity made her the subject of much unpleasant notoriety, the Comtesse d'Agoult's salon was, for many years, the rendezvous of many leading statesmen, poets, critics, painters, and musicians. There Alfred de Vigny and Sainte-Beuve were frequently seen; there Ponsard read his tragedy of *Lucrèce* for the first time; and there Prince Lichnowski appeared between his adventures in the Carlist War and his murder by the rabble at Frankfort. During the period from 1838-48 her salon had merely a social character. When, however, the fall of Louis Philippe in the revolution of 1848 led her to join the ultra-democratic party and to begin her crusade against "property and capital, orthodoxy and family," society was closed against her, and it was then that such men as Rodrigues, Enfantin, Lamartine, and Louis Blanc sought her company.

AGOUTA, á-gōō′tá (native name). An insectivorous mammal (*Solenodon paradoxus*) of Haiti resembling a very large rat, nocturnal in its habits, uttering a piercing cry, and destructive to poultry. This and a Cuban species, the Almiqui (*Solenodon cubanus*), represent the peculiar family Solenodontidæ.

AGOUTI, á-gōō′tē (Fr. through Sp., from the native name). Any of several small rodents of South America and the West Indies, of the genus Dasyprocta, and family Dasyproctidæ. They are 18 or 20 inches long, have somewhat squirrel-like forms, with slender legs and hoof-like claws, and are brownish above and yellowish below. They inhabit woodlands, where they are gregarious and dwell in holes, and whence they ramble abroad, mainly at night, with grunting cries, to feed on vegetables, often doing great damage to sugar-cane. Several species are known as: the "pampas hare," pursued as game in southern Brazil and southward; Azara's, the acouchy (or acuchi) of Guiana and the West Indies; the black and the yellow-rumped, which are West Indian and best known. Also spelled agouty and aguti; it is to be noted that Darwin (*A Naturalist's Voyage*) applies the name to the Patagonian cavy. See Plate of Cavies accompanying Cavy.

AGRA, ä′grá. A district and a division in the North-West Provinces (q.v.) of British India (Map: India, C 3). Population of district, 1891, 1,003,800; 1901, 1,060,500; of division, 1891, 4,768,000; 1901, 5,248,100.

AGRA (evidently from *Akbarabad*, city of Akbar). A city in the United Provinces of Agra and Oudh, British India, in the district of the same name on the right bank of the Jumna, 110 miles southeast of Delhi and 841 miles by rail northwest of Calcutta (Map: India, C 3). As the railway and administrative centre of its district and of the large "division" to which it gives its name, Agra is a place of great importance. It has an extensive trade in cotton, tobacco, indigo, salt, sugar, and grain, and manufactures of inlaid mosaic work, for which it is famous, gold lace, and shoes. It also has a considerable transport trade by the Jumna and Agra Canal. Agra is fortified and has a garrison; there is a military station in the neighborhood of the city. The climate during the hot and rainy seasons (April to September) is injurious to Europeans, but, on the whole, the average health of the city is equal to that of any other station in the North-West Provinces. The mean annual temperature is 79° F.; January, 60°, June, 95°. The ancient walls of the city embrace an area of about 11 square miles, of which about one-half is at present occupied. The houses are, for the most part, built of the red standstone of the neighboring hills. The principal street, running northwest from the fort, is very spacious, but the rest are generally narrow and irregular, though clean. The Strand, a thoroughfare on the river banks, is two miles long and eighty feet wide.

Some of the public buildings, monuments of the House of Timur, are of striking magnificence. Among these are the fine fortress built by Akbar, within the walls of which are the palace and audience-hall of Shah Jehan, and the Moti Masjid or Pearl Mosque, so called from its surpassing architectural beauty. Still more celebrated is the Taj Mahal, situated without the city, about a mile to the east of the fort. This extraordinary and beautiful mausoleum was built by the Emperor Shah Jehan for himself and his favorite wife, Arjimand Banoo (surnamed Mumtaz Mahal). Twenty thousand men, says Tavernier, who saw the work in progress, were employed incessantly on it for twenty-two years. The principal parts of the building are constructed or overlaid outside and in with white marble; and the mosaic work of the sepulchral apartment and dome is described by various travelers in terms of glowing admiration. It is composed of twelve kinds of stones, of which lapis-lazuli is the most frequent, as well as the most valuable. Of British and other European edifices in and near the city, the principal are the buildings of a Catholic mission and episcopal see founded in the sixteenth century, the government house, the college for the education of natives, the Metcalfe testimonial, the English church, and the barracks. A committee appointed by the government administers municipal affairs, derives revenue from real estate and octroi, and operates the water works. This city is held in great veneration by the Hindus as the scene of the incarnation of Vishnu under the name of Parasu Rama. It first rose to importance in the beginning of the sixteenth century, and from 1526 to 1658 it was the capital of the Mogul sovereigns. In the latter year Aurungzebe removed to Delhi; henceforth Agra declined. It was taken in 1784 by Scindia, and surrendered in 1803 to Lord Lake after a bombardment of a few hours. During the Sepoy mutiny of 1857 Agra was one of the places in which the Europeans were shut up. They were obliged to abandon the city in June and retire to the fort or residency, to which fugitives also flocked from all parts of the country. Most of the European buildings in the city were burned by the Sepoys. Heroic sallies were made from the fort, until the place was relieved in October by the rapid and brilliant march of Colonel Greathed. Pop., 1891, 168,662; 1901, 188,022. See H. G. Keene *The Agra Guide* (Agra, 1872), and E. B. Havel, *Handbook to Agra*, etc. (London, 1904).

AGRAM, ä′grȧm (Hungarian *Zágráb*, Croatian *Zagreb*). The capital of the Hungarian Crownland of Croatia-Slavonia, beautifully situated at the foot of the Agram Mountains, about 2 miles from the Save, and 141 miles east-northeast of Fiume by rail (Map: Hungary, D 4). It consists of the upper, lower, and episcopal towns. The chief public buildings are the cathedral, a late Gothic edifice dating from the fifteenth century; the palace of the *ban*, or governor; the National Theatre; the Gothic church of St. Mark; the archiepiscopal palace; the Academy of Sciences, with fine collections of pictures and antiquities, and the palace of justice. Agram is the seat of government of the highest courts of the province and of the archbishop. The city is a great centre of South-Slavic national life. Its educational institutions include the Franz Josef University, founded in 1874, a gymnasium, a high school, industrial school, normal training schools, and several libraries. Its manufactures include leather, linen, porcelain, silk, and tobacco, and it has a considerable trade in grain and wine. Pop., 1890, 38,000, mostly Croats; 1900, 57,690. Probably Roman in origin, Agram became an episcopal see in 1093, and was destroyed by the Tartars in 1242. Rebuilt and made a free royal city, it developed rapidly. In 1880 it was partially destroyed by an earthquake.

AGRAMONTE, ä′grȧ-mōn′tȧ, IGNACIO (1841-1873). A Cuban revolutionist. He was born at Puerto Príncipe, Cuba, studied law at the University of Havana, and was admitted to the bar in 1867. He took a conspicuous part in the insurrection which broke out against Spain in 1868, and became secretary of the provisional government in 1869. He commanded the Cuban forces in the Camagüey district, and for some time—on the retirement of Quesada, Jordan, and Cavada—acted as commander-in-chief. He was killed in the battle of Jimaguayú.

AG′RAPHA (Gk., unwritten, from ἀ, *a*, priv. + *γράφειν, graphein*, to write). Alleged sayings of Jesus which, though not found in the canonical gospels, were current either in oral tradition or in literature and are worthy of being considered genuine words of Christ. A very complete collection of extra-canonical sayings was made by Cotelerius, *Ecclesiæ Græcæ Monumenta* (1677-1688), who was followed by J. E. Grabe, *Spicelegium* (1698 and 1700), and J. B. Fabricius, *Codex Apocryphus Novi Testamenti*, second edition (1719). Briefer collections, based on the above, have been published from time to time. The latest and most complete work on the subject is that of Alfred Resch, *Agrapha*, in Gebhardt and Harnack's *Texte und Untersuchungen* (Leipzig, 1889). Out of a much larger number Resch has judged seventy-four sayings worthy of the designation "agrapha." Resch's conclusions have been criticised by Professor J. H. Ropes, *Die Sprüche Jesu* (Leipzig, 1896), who reduces the number of probably genuine sayings to thirteen. In 1897 Messrs. Grenfell and Hunt published (Henry Frowde, London) a papyrus fragment from Egypt containing seven sayings, each one except the first prefaced by the words, "Jesus saith." Three of these "logia" are quite similar to sayings in the gospels. The remaining four are new, and may possibly be genuine words of our Lord.

AGRAPH′IA. A symptom of disease of the nervous system. See under APHASIA.

AGRA′RIAN LAW (Lat. *leges agrariæ*). Laws regulating the division or holding of the public lands (*ager publicus*) of the Roman domain. With the name of agrarian laws was formerly associated the idea of the abolition of property in land, or at least of a new distribution of it. This notion of the agrarian laws of the Romans was not only the popular one, but was also received by most scholars. The French Convention, in 1793, passed a law punishing with death any one who should propose an agrarian law, understanding by the term an equal division of the soil among all citizens. Now, it would have been strange if the Romans, with whom private property was so sacred, could ever have been brought to sanction any measure of the kind. It was the German scholars, Heyne, Savigny, and especially Niebuhr, who first explained the true nature and character of the Roman agrarian laws. There are still some disputed points in this matter; but one thing seems settled—that those laws had no reference to private lands held in absolute property, but to public or State lands.

As the dominion of Rome extended, a portion more or less of each conquered territory was confiscated to the State, and became public domain. All laws respecting the disposition of these lands were called agrarian laws, which are therefore of various kinds. What caused these laws to be so long mistaken for an interference with private rights, and excited such opposition to them at the time, was the use which was made of the public domains while unappropriated. "It was the practice at Rome," says Dr. Arnold, "and doubtless in other States of Italy, to allow the individuals to occupy such lands, and to enjoy all the benefits of them, on condition of paying to the State the tithe of the produce, as an acknowledgment that the State was the proprietor of the land, and the individual merely the occupier. Now, although the land was undoubtedly the property of the State, and although the occupiers of it were in relation to the State mere tenants-at-will, yet it is in human nature that a long undisturbed possession should give a feeling of ownership; the more so as, while the State's claim lay dormant, the possessor was, in fact, proprietor, and the land would thus be repeatedly passing by regular sale from one occupier to another."

The State, however, was often obliged to interfere with these occupiers of the public lands and to resume its rights. The very idea of a citizen, in ancient times, involved that of a landholder, and when new citizens were to be admitted, each one had to receive his portion out of the unallotted public domain; which was attended, of course, with the ejection of the tenants-at-will. It appears, also, that the right to enjoy the public lands in this temporary way was confined to the old burghers or patricians. This, taken in conjunction with the tendency, strong at all times, of larger possessions to swallow up smaller, kept up an ever-increasing number of landless commons, whose destitution and degradation came from time to time to such a pitch that alleviation was necessary to prevent the very dissolution of the State. It is easy, however, to see what motive the patricians, as a body, had to oppose all such measures, since it was their interest, though not their right, to keep the lands unallotted.

The enactment of agrarian laws occasioned some of the most remarkable struggles in the internal history of Rome. Most of the kings of Rome are said to have carried an agrarian law; that is, to have divided a portion of the public land among those whom they admitted to the rights of citizenship. About twenty-four years after the expulsion of the Tarquins, the distress of the commons called aloud for remedy, and the consul Spurius Cassius proposed an agrarian law for a division of a certain proportion of the public land, and for enforcing the regular payment of the rent or tithe from the occupiers of the remainder. The aristocracy, however, contrived to defeat the proposal, and when the year of his consulship was out, Cassius was accused of trying to make himself king, was condemned, scourged, and beheaded, and his house razed to the ground.

The first important agrarian law of a permanent nature actually passed was that proposed by the tribune Licinius Stolo, and carried, after a struggle of five years, in the year 367 B.C. The provisions of Licinius's bill, or *rogation*, were as follows: "Every Roman citizen shall be entitled to occupy any portion of the unallotted State land not exceeding 500 *jugera* (see ACRE), and to feed on the public pasture land any number of cattle not exceeding 100 head of large, or 500 head of small, paying in both cases the usual rates to the public treasury. Whatever portions of the public land beyond 500 *jugera* are at present occupied by individuals shall be taken from them, and distributed among the poorer citizens as absolute property, at the rate of seven *jugera* apiece. Occupiers of public land shall also be bound to employ a certain number of freemen as laborers."

This law produced for a time very salutary effects. But before the year 133 B.C., when Tiberius Gracchus was elected tribune, the Licinian law had been suffered to fall into abeyance; and although vast tracts had been acquired by the Italian, the Punic, and the Greek wars, no regular distribution of land among the destitute citizens had taken place for upward of a century. Numerous military colonies had indeed been founded in the conquered districts, and in this way many of the poorer Romans or their allies had been provided for; but there still remained large territories, the property of the State, which, instead of being divided among the poorer members of the State, were entered upon and brought into cultivation by the rich capitalists, many of whom thus came to hold thousands of *jugera*, instead of the five hundred allowed by the Licinian law. To a Roman statesman, therefore, looking on the one hand at the wretched pauper population of the meaner streets of Rome, and on the other at the enormous tracts of the public land throughout Italy which the wealthy citizens held in addition to their own private property, the question which would naturally present itself was: Why should not the State, as landlord, resume from these wealthy capitalists, who are her tenants, as much of the public land as may be necessary to provide little farms for these pauper citizens, and so convert them into respectable and independent agriculturists? This question must have presented itself to many; but there were immense difficulties in the way. Not only had long possession of the State lands, and the expenditure of large sums in bringing them into cultivation, given the wealthy tenants a sort of proprietary claim upon them, but in the course of generations, during which estates had been bought, sold, and inherited, the State lands had become so confused with private property that in many cases it was impossible to distinguish between the two. Notwithstanding these difficulties, Tiberius Gracchus had the boldness to propose an agrarian law, to the effect that every father of a family might occupy 500 *jugera* of the State land for himself and 250 *jugera* additional for each of his sons; but that, in every case where this amount was exceeded, the State should resume the surplus, paying the tenant a price for the buildings, etc., which he had been at the expense of erecting on the lands thus lost to him. The recovered lands were then to be distributed among the poor citizens; a clause being inserted in the bill to prevent these citizens from selling the lands thus allotted to them, as many of them would have been apt to do.

According to the laws and constitution of Rome, there was nothing essentially unjust in this proposal, which was, in private, at least, approved of by some of the most distinguished men of the time. The energy of Tiberius Gracchus carried the measure, in spite of the opposition of the aristocratic party, to whose enmity he fell a victim. His work was taken up a decade later by his brother Gaius, who also met a violent death. (See GRACCHUS.) The attempts to carry out the "Sempronian law," as it was called (from the name of the *gens* to which the Gracchi belonged), were attended with great difficulties, and although not formally repealed, it continued to be evaded and rendered inoperative. Various agrarian laws were subsequently passed, some by the victorious aristocratic party, in a spirit directly opposed to the Licinian and Sempronian laws.

Besides agrarian laws having for their object the division among the commons of public lands usurped by the nobles, there were others of a more partial and local nature, for the establishment of colonies in particular conquered districts; these naturally met with less opposition. Still more different were those violent appropriations of territory made by the victorious military leaders in the later times of the Republic, in order to reward their soldiers and to establish exclusively military colonies. In these the private rights of the previous occupants were often disregarded.

AGRARIAN MOVE'MENT. (Lat. *agrarius*, pertaining to land, field, *ager*). A movement among farmers to promote their interests. It comprises efforts at trade organization, often with political consequences. Such movements took place in England long ago, and were particularly active in the period of the anti-corn-law agitation. During the last thirty years, owing to the effect of falling prices on agriculture, there has been an influential agrarian movement in all western countries. It has been strongest politically in Germany, where the first congress of north German farmers met at Berlin in 1868. This and subsequent congresses until 1875 were conservative bodies made up of many large land owners and members of the aristocracy. They discussed technical questions in agriculture and its social and economic interests. In 1875 they began to agitate for tax and land reform legislation, and soon developed a party demanding protective tariffs. In 1893 the Union of Farmers (*Bund der Landwirte*) was formed, and only two years later had a membership of 200,000. Its objects were to oppose political treaties which lower tariff duties on grain, to encourage legislation for meat inspection, to agitate for bimetallism, reduction of land taxes, government elevators, cheap personal credit, extension of railroads, and larger government appropriations for agriculture. Owing to the influence of the agrarians in the Reichstag, the German customs laws of December 25, 1902, which went into effect March 1, 1906, placed upon grains minimum duties which may not be reduced through commercial treaties with other countries. These duties represent a considerable advance over those of the earlier laws. Important increases in duties on meat products were also secured by the agrarians. Similar movements exist in France, Denmark, the Netherlands, England, Sweden, and Italy. In the United States less has been done in a direct political way, although farmers' organizations have been even more successful in other ways. Such organizations as the Grange (q.v.) and the Farmers' Alliance (q.v.) were chiefly established for educational and mutual advantages, and especially to resist encroachments of the railroads in discriminating rates. References: H. Thiel, *25 Jahre landwirtschaftlicher Interessenvertretung* (1894); C. S. Walker, "The Farmers' Movement," *Annals of the American Academy of Political and Social Science*, Volume IV. (Philadelphia, 1893-94).

AGRARIAN PAR'TY. See POLITICAL PARTIES, paragraph on *Germany*.

AGREDA, ȧ-grā'dȧ, MARIA (CORONEL) DE (1602-64). The superior of the convent of the Immaculate Conception, whose monastic name was Maria of Jesus. She was born at Agreda, Spain. She reported that she had had revelations from heaven, and that God had commanded her to write an inspired life of Mary, the mother of Jesus. The book is entitled *Mystica Ciudad de Dios*, etc., 3 parts (Madrid, 1670; French translation, *La cité mystique de Dieu*, etc., 6 volumes, Marseilles, 1695, Paris, 1857; German translation, *Die geistliche Stadt Gottes*, etc., second edition, Regensburg, 1893). Pope Innocent XI. prohibited its universal circulation, but, at the request of the King of Spain, excepted the Spanish countries. An English translation has recently been made.

AGREE'MENT. See CONTRACT.

AGREEMENT, METHOD OF. See INDUCTION.

AGREEMENT OF THE PEO'PLE, THE. A remarkable document set forth by the Council of the Army, January 15, 1649, fifteen days before the execution of King Charles I. of England. It is based upon "The Heads of the Proposals Offered by the Army," August 1, 1647, except that no reference is made to royalty; and it is an outline of a written constitution for a republic. According to its provisions, the existing parliament is to be dissolved on or before the last day of April, 1649; and thereafter an assembly called the "Representative," composed of not more than four hundred members, is to be elected by the people every two years on the first Thursday in May. The members or "representers" are fairly distributed among the counties of England and Wales, thus remedying the defects in the existing apportionment. The franchise is conferred upon such natives or denizens "as are assessed ordinarily toward the relief of the poor," provided they be men twenty-one years of age or housekeepers "dwelling within the division for which the election" is held. Servants "receiving wages from any particular person" are excluded; and those who have aided the king are temporarily denied the right of voting or of being chosen members of the assembly. Officials are not eligible, and lawyers are incapable of practicing their profession while serving as representers. There is to be a "Council of State for the managing of public affairs." The Christian religion "is held forth and recommended as the public confession;" but it is to be "reformed to the greatest purity in doctrine, worship, and discipline." Popery and prelacy are not tolerated, and the "teachers" or ministers are to be paid from the public treasury. To the assembly is given the "supreme trust in order to the preservation and government of the whole;" but six important points are absolutely "reserved" from legislative action. In this regard the agreement differs from the constitutions of the American States, which are subject to unlimited amendment or entire change. With the exception of those of the Connecticut and New Haven colonies, the agreement is the earliest example of a written instrument designed for the government of a commonwealth. For the text of the agreement, consult: Gardiner, *Constitutional Documents*, pages 270-282 (Oxford, 1889); for a full discussion, his *History of the Civil War*, new edition (London and New York, 1894-97).

AGRIC'OLA, Christoph Ludwig (1667-1719). A Bavarian landscape painter. He was born and died at Regensburg. He was a wide traveler, but lived for long periods at Naples. His pictures are of the cabinet order. His affection for nature was strong, and he was especially happy in reproducing effects of climate. In composition he followed somewhat closely Gaspard Poussin (q.v.), though he shows the influence of Claude Gelée (q.v.) in his management of color and light. His pictures are to be found in many towns of Germany and Italy, notably at Dresden, Vienna, Florence, and Naples. Though primarily a landscape painter, he executed numerous portraits.

AGRICOLA (Latin version of his original German name Bauer), Georg (1490-1555). A German mining engineer, founder of the sciences of mining and mineralogy. He was born at Glauchau, studied medicine at Leipzig and in Italy, and later, while practicing as physician in the Saxon Erzgebirge, became much interested in mineralogy and in the methods of mining. In recognition of his endeavors to improve mining methods he received a pension from Maurice, Duke of Saxony, and in 1531 settled in Chemnitz, where he devoted himself to the study of mineralogy and mining engineering, and served also as city physician and as burgomaster. His efforts resulted in the establishment of mining engineering upon a rational, scientific basis, in that his theories regarding ore deposits were founded on sound principles, which he applied to the practical working of the mines. He also made one of the earliest classifications of minerals, based upon their external characteristics of form, color, and hardness. Agricola wrote several works, all of which are classics in the literature of the two sciences to the foundations of which he contributed in so large degree. Among the more important are: *De Ortu et Causis Subterraneorum* (Basel, 1546-58); *De Re Metallica* (Basel, 1530-58), which was for a long period used as a manual of mining methods in Germany. A collection of his writings on mineralogy, *De Natura Fossilium*, was published at Basel (1657; German translation, Freiburg, 1806-13). Consult: Jacobi, *Der Mineralog Georg Agricola und sein Verhältniss zur Wissenschaft seiner Zeit* (Werdau, 1889).

AGRICOLA, Gnæus Julius (37-92). A Roman of the imperial times, distinguished not less by his great abilities as a statesman and a soldier than by the beauty of his private character. He was born at Forum Julii (now Fréjus, in Provence). Having served with distinction in Britain, Asia, and Aquitania, and gone through the round of civil offices, he was, in 77 A.D., elected consul, and in the following year proceeded as governor to Britain—the scene of his military and civil administration during the next seven years. He was the first Roman general who effectually subdued the island, and the only one who displayed as much genius and success in training the inhabitants to the amenities of civilization as in breaking their rude force in war. In his seventh and last campaign (84 A.D.), his decisive victory over the Caledonians under Calgacus, at a place called Mons Grampius, established the Roman dominion in Britain to some distance north of the Forth. After this campaign his fleet circumnavigated the coast for the first time, proving Britain to be an island. Among the works executed by Agricola during his administration were a chain of forts between the Solway Firth and the Tyne, and another between the firths of Clyde and Forth. Numerous traces of his operations are still to be found in Anglesey and North Wales, and in Galloway, Fife, Perthshire, and Forfarshire. The news of Agricola's successes inflamed the jealousy of the Emperor Domitian, and he was speedily recalled. Thenceforth he lived in retirement, and when the vacant proconsulships of Asia and Africa lay within his choice, he prudently declined promotion. The jealousy of the Emperor, however, is supposed to have hastened his death, which took place at the early age of fifty-five. His *Life*, by his son-in-law, Tacitus, has always been regarded as one of the choicest specimens of biography in literature. See Tacitus.

AGRICOLA, Johann (1492-1566), also called Magister Islebius (i.e., of Eisleben), but seldom by his patronymic, Schnitter. A zealous disciple of Luther, whom he served, as teacher and preacher, at Frankfort-on-the-Main, Eisleben, and Wittenberg. He became involved in the Antinomian controversy (see Antinomianism), and withdrew to Berlin in 1540, where, under stress of poverty, he made a recantation, ineffectual, and probably not sincere. Joachim II., Elector of Brandenburg, became his protector, and made him court preacher and general superintendent, in which office he labored zealously for the spread of Protestantism until his death at Berlin, September 22, 1566. His share in drawing up the Augsburg Interim (1548) made him unpopular for a time, but did not permanently check the growth of his influence in Brandenburg, which became very great. He wrote several theological treatises, now forgotten, but he will always be remembered for his collection of German proverbs, *Die gemeinen deutschen Sprüchwörter mit ihrer Auslegung* (1592), a work of native humor, morality, and patriotism that has endeared him to the heart of scholarly Germany.

AGRICOLA, Johann Friedrich (1720-74). A German musical composer who studied under Bach. He was a superior organist, and held the office of kapellmeister under Frederick the Great. He wrote several operas, together with cantatas and chorals.

AGRICOLA, Martin (1486-1556). A German composer and writer on musical subjects, born at Sorau, Silesia. From 1524 until his death he was cantor and musical director in the first Protestant school established at Magdeburg. His books are marked by a forceful style and extensive knowledge, and in his own day passed through numerous editions. He has been inaccurately credited with having been the first composer to reject the ancient "tablature," or system of musical notation. His writings include: *Musica Instrumentalis* (1529), *Musica Figuralis Deudsch* (1532), *Rudimenta Musices* (1539), *Questiones Vulgariores in Musicam* (1543), and other similar works.

AGRICOLA, RODOLPHUS (properly ROELOF HUISMAN) (1443-85). An eminent Dutch humanist, born at Baflo. He studied at the universities of Louvain and Paris and afterward in Italy, and by his Latin style and his skill in disputation attained high scholastic distinction. For some time he lectured on philology and philosophy at Heidelberg. The most important of his works is the *De Inventione Dialectica*, in three books; but he is noteworthy less for his writings than for his personal influence. He did much to substitute classical Latinity for mediæval barbarisms, to diffuse in Germany the knowledge of Greek; in short, to transmit beyond the Alps the spirit of the Italian renaissance of letters. Of theology, painting, and music he seems also to have known considerable. His writings were collected by Alardus (Cologne, 2 volumes, 1539). Consult: Tresling, *Vita et Merita Rodolphi Agricolæ* (Groningen, 1830), and Ihm, *Der Humanist Rudolf Agricola, sein Leben und seine Schriften* (Paderborn, 1893).

AG'RICUL'TURAL ANT. A species of ant living on the semi-arid plains of Texas that cultivates areas of grass about its dwelling. On this cultivated space, which may have a diameter of 10 to 15 feet, only one kind of grass is allowed to grow, and it is said that the seeds of this grass are even planted by the ants. Roads are laid out radiating from the ant hill across the plain, and all shoots of undesirable plants are promptly nibbled off as rapidly as they appear among the crops. When the harvest of the protected grass is ripe, the ants collect the seeds and convey them along the radiating highways to the chambers in the hill. Interesting and wonderful as is the economy of these ants, the insects may, when the colonies are large and numerous enough, do considerable damage to the grain fields in which the mounds are reared and the clearings made. See ANTS; INSECTS; and consult McCook, *Agricultural Ant of Texas* (Philadelphia, 1879).

AGRICULTURAL ASSO'CIA'TION. A voluntary association of farmers and other persons interested in agriculture, formed for the purpose of promoting a knowledge of agriculture.

GREAT BRITAIN. The movement began with the organization of the Society of Improvers in the Knowledge of Agriculture in Scotland, in 1723, by a company of landholders. This society existed for more than twenty years and did much valuable work. Its *Select Transactions*, collected by Mr. Maxwell, were published in 1743. The Bath and West of England Society was established in 1777, and the Highland Society in 1784. The latter society afterward included in its operations the whole of Scotland, and under the name of the Highland and Agricultural Society of Scotland has ever since continued its work with increasing success and usefulness. For many years its *Prize Essays* and *Transactions* were published in connection with the *Quarterly Journal of Agriculture*. In 1842 an Agricultural Chemistry Association was formed at Swanstone, near Edinburgh, which for several years conducted investigations independently, but finally merged in the Highland and Agricultural Society. The Highland Society now has a numerous membership. Its large income is expended in studying manures, feeding stuffs, seeds, plants, etc.; further, in holding annual shows of live stock, implements, etc., at which large prizes are offered, and, finally, in publishing an annual volume of *Transactions*.

The Royal Agricultural Society of England, founded in 1838, has been an important factor in the development of British agriculture, and, indeed, has undertaken many duties which in other countries are performed by the Government. This society has at present more than 10,000 members, holds an annual show of live stock, implements, and machinery, dairy and other products, at which some £5000 ($25,000) are distributed in prizes. It issues a quarterly journal, containing information on a great variety of agricultural topics, retains the services of chemical, botanical, zoölogical, and veterinary experts for advice to members, as well as for experiments and research, maintains an experimental farm at Woburn and a veterinary college at Camden Town, London, and conducts in coöperation with the Highland and Agricultural Society of Scotland an annual examination for a national diploma in the science and practice of agriculture.

IRELAND. In Ireland the interests of agriculture are promoted by a department of the Royal Dublin Society, chartered in 1749, and other agricultural organizations. Agricultural societies are maintained also in Canada, Australia, and other parts of the British Empire.

UNITED STATES. In the United States the first society for promoting agriculture was established at Philadelphia in 1785. In the same year a similar society was formed in South Carolina, to which the present State Agricultural Society of South Carolina traces its origin. The New York Society for the Promotion of Agriculture, Arts, and Manufactures was organized in 1791 and published its first volume of *Transactions* in 1792. The Massachusetts Society for Promoting Agriculture was incorporated in 1792 and began the publication of pamphlets on agricultural topics in 1797. Several other societies were organized prior to the beginning of the nineteenth century. This movement continued, until in 1809 we have the germ of a national organization in the Columbian Agricultural Society, formed in the District of Columbia. The holding of agricultural shows, or "fairs," was begun in the city of Washington in 1804, and was made a popular movement largely through the efforts of Elkanah Watson of Massachusetts, who, beginning with an exhibition of two imported merino sheep on the public square at Pittsfield, Mass., in 1807, soon developed the more elaborate and picturesque "cattle shows," which for many years have been popular rural festivals, especially in New England. Shows of various sorts are now held in different parts of the country by numerous State, county, and other local and interstate associations. Societies for promoting different agricultural interests have been organized under many different forms, and many of these are now in a flourishing condition. Many of the States have important agricultural societies, the published reports of which contain much valuable information. There are also national, State, and local associations for the live stock interests (including the breeding of cattle, horses, sheep, swine, and poultry), dairying, horticulture, forestry, irrigation, good roads, bee-keeping, etc. Lists of the more important agricultural organizations in the United States are given in the *Year Book of the United States Department of Agriculture.*

Among the general associations which have exerted the most widespread influence in the United States are the Farmers' Alliance and the Patrons of Husbandry (otherwise known as the Grange). See the separate articles on FARMERS' ALLIANCE, and GRANGE.

GERMANY. The first agricultural society in Germany is said to have been established in 1764. Now there are several thousand societies in the German Empire. The most important of these is the German Agricultural Society, with headquarters at Berlin, which has a membership of some 10,000. It holds a great annual meeting and fair, at which numerous prizes are given, a winter meeting, and meetings of sections on fertilizers, plant culture, seeds, implements, and agricultural technology and engineering; gives prizes for essays based on scientific investigations, tests agricultural materials, carries on a large amount of experimental inquiry through coöperation with agricultural experiment stations, publishes a year-book, and a journal appearing two or three times a month, and maintains a bureau of information. It also aids its members in the coöperative purchase of fertilizers, seeds, and feeding stuffs.

FRANCE. The Society of Agriculturists of France has more than 11,000 members, maintains a library and chemical laboratory, holds meetings, at which lectures are given by eminent agricultural experts, gives annual prizes, and patronizes the agricultural shows given under the ministry of agriculture in different parts of France. The National Society of Agriculture of France and the National Society for the Promotion of Agriculture are also very important French societies.

The Royal Danish Agricultural Society, the Central Society of Agriculture of Belgium, the Society of Italian Agriculture, the Imperial Agricultural Society at Vienna, the Agricultural Association of Hungary, and the Imperial Economic Association at St. Petersburg are among the most active and influential agricultural organizations in Europe.

AGRICULTURAL SYNDICATES. In recent years coöperative unions (see COÖPERATION) have been formed in large numbers in most of the countries of Europe, and have exerted an increasing influence in the promotion of agricultural advancement. These have reached their most complete development, as directly related to agriculture, in France, where they are known as agricultural syndicates. The syndicates are national, regional, or local in their organization and operations. Their number has reached about 2500 and their membership about 800,000, including all classes interested in agriculture. They do an extensive business in the purchase of fertilizers, feeding stuffs, seeds, plants, implements, and live stock (especially animals for common use in breeding), and in the sale of agricultural products. They have also established coöperative dairies, and factories for fruit pulp, olive oil, etc., and have developed numerous forms of coöperative insurance. They have also disseminated much information through meetings and the agricultural press, and have exerted important political influence on legislation affecting agricultural interests. Some syndicates have received financial aid from the Government, and others have been aided by private endowments. Otherwise they are supported by fees and brokerage. The organization and spread of the syndicates have been greatly promoted by the assistance of the agricultural societies throughout France.

AGRICULTURAL CHEM'ISTRY. See CHEMISTRY, AGRICULTURAL.

AGRICULTURAL ED'UCA'TION. The modern system of agricultural education in its most complete form includes (1) university courses of instruction and research (experiment stations); (2) general college courses; (3) college courses or schools in special subjects, e.g., dairying, animal husbandry, aviculture, or veterinary science; (4) secondary courses or schools (agricultural high schools); (5) elementary instruction in common schools; (6) university extension, through farmers' institutes, correspondence courses, etc. The term agriculture, as related to education, may be used broadly with reference to an institution or course of instruction in which agricultural subjects are taught along with other branches of knowledge. It is in this sense, for example, that we speak of a college of agriculture or a college course in agriculture. Or the term may be restricted to that portion of a course of instruction in which agricultural subjects only are taught, as when we say: "Agriculture is taught in that college." Committees of the Association of American Agricultural Colleges and Experiment Stations have recently recommended that the following subjects be included in a four-year college course in agriculture: Algebra, geometry, trigonometry, drawing, English, other modern languages, psychology, ethics or logic, political economy, general history, constitutional law, physics, chemistry (general and agricultural), meteorology, geology, botany (including vegetable physiology and pathology), zoölogy (including entomology), physiology, veterinary science, horticulture, forestry, and agriculture (in the narrow, technical sense). The committee on methods of teaching agriculture of the same association has divided technical agriculture into (1) agronomy (plant production); (2) zoötechny (animal industry); (3) agrotechny (agricultural technology); (4) rural engineering (farm mechanics); and (5) rural economics (farm management).

In the syllabus for the course in agriculture formulated by this committee, agronomy is defined as "the theory and practice of the production of farm crops," and is made to include what is to be taught regarding the structure, composition, and physiology of farm crops and their environment, i.e., climate, soil, fertilizers, etc., and regarding the culture, harvesting, preservation, and uses of individual kinds of crops, as well as the obstructions to their growth from weeds, fungi, bacteria, insects, birds, and other animals. Zoötechny is "the theory and practice of the production of animals useful to man," and includes especially types, breeding, feeding, hygiene, and systems of management of different kinds of farm animals. Agrotechny is "the theory and practice of the conversion of raw materials produced by agriculture into manufactured articles for use in commerce and the arts." In its broadest sense, agrotechny includes such things as the making of butter, cheese, sugar, vinegar, concentrated foods, canned goods, liquors, textiles, leather, etc.; but in the agricultural colleges generally, only dairying is usually taught under this head. Rural engineering is "the science and art of laying out farms, designing and constructing farm buildings and works [i.e., water systems, irrigation works, drains, sewage systems, and roads], and making and using farm implements and machinery." Rural economics "treat of agriculture as a means for the production, preservation, and distribution of wealth by the use of land for the growing of plants and animals."

UNITED STATES. Agitation on behalf of agricultural education began very soon after the organization of the first agricultural societies (see AGRICULTURAL ASSOCIATION), near the end of the eighteenth century. In 1792, under the influence of the New York Agricultural Society, the trustees of Columbia College in New York City established "a professorship for natural history, chemistry, and agriculture," and elected Samuel L. Mitchill, M.D., LL.D., an active member of the Society, to fill the chair. In 1794 the Philadelphia Society received an elaborate report from one of its committees, in which the claims of education in agriculture through the establishment of college professorships, as well as of courses of instruction in the common schools, are urged upon the attention of the State legislature. In 1801 the Massachusetts society started a subscription, which resulted in the establishment of a professorship of natural history in Harvard College in 1804, and later in the establishment of a botanic garden. Books on agriculture began to be published frequently in this country, among which was *The Farmers' Assistant*, by John Nicholson (Albany, N. Y., 1814), "embracing every article relating to agriculture, arranged in alphabetical order." *The American Farmer*, the first distinctively agricultural periodical in this country, was started in Baltimore, Md., in 1819. The Gardiner Lyceum, begun in 1823, in Maine, with the aid of a grant of money from the State, especially for the education of mechanics and farmers, had a professor of agriculture, a practical farm, and special short winter courses, and was successfully maintained for many years. An agricultural school established at Derby, Conn., in 1826, proved immediately successful. A number of other schools in which agriculture was taught were established in Connecticut and New York between 1825 and 1850.

In 1846, John P. Norton was appointed professor of agricultural chemistry and vegetable and animal physiology at Yale College. His pupil and successor was Samuel W. Johnson, the well-known author of *How Crops Grow*, who for many years has been a leader in the movement for agricultural education. Associated with him, as professor of agriculture, has been William H. Brewer, who was also a student under Professor Norton, and was identified with agricultural schools established in New York prior to 1860. The New York Legislature passed acts in 1853 establishing a State agricultural college and an industrial school, to be known as "The People's College." These institutions, however, did not become firmly established, though Amos Brown, the president of the latter, was largely instrumental in securing national legislation favoring industrial education. Agricultural colleges which have grown to be permanent and strong institutions were opened in Michigan in 1857 and in Pennsylvania and Maryland in 1859.

LAND-GRANT ACTS. Meanwhile, other forces were at work which created a widespread demand for a new class of institutions which should be devoted to scientific and technical education. A national leader for this movement was found in Justin S. Morrill of Vermont. On December 14, 1857, Mr. Morrill introduced into the House of Representatives a bill "donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and mechanic arts." Though reported at first adversely, and after passage vetoed by President Buchanan, this bill, with important amendments, was finally passed by Congress, and was approved by President Lincoln, July 2, 1862. In its final form, this land-grant act was a comprehensive measure providing for "the endowment, support, and maintenance of at least one college [in each State] where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and mechanic arts * * * in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life." For these purposes there were granted to the several States 30,000 acres of land for each member of Congress, the entire proceeds of the sale of which was to constitute a perpetual fund yielding not less than 5% interest. The total fund received by the colleges established under this act is over $12,000,000, and in 1905 844,164 acres still remained to be sold, valued at $4,101,749.

Amid many discouragements within and without, the courses in agriculture in the colleges established under this act gradually made their way. In 1887, a new impetus was given to their development by the act of Congress (Hatch Act) giving each State $15,000 for an agricultural experiment station (see AGRICULTURAL EXPERIMENT STATION), which must ordinarily be a department of the land-grant college. And in 1890, these colleges received a further national endowment, under a second Morrill Act, providing an immediate appropriation of $15,000 to each State and Territory, an increase of $1000 each year for ten years, and thereafter $25,000 annually, "to be applied only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural, and economic science." Provision is made for separate institutions for white and colored students in States which may desire to make such an arrangement. Fourteen States have taken advantage of this provision. These supplementary acts have been of great advantage to agricultural education in this country.

Sixty-five colleges are in operation under the acts of 1862 and 1890, of which sixty-three maintain courses in agriculture. These institutions are brought together to constitute a national system of higher education in the sciences and industries by the Association of American Agricultural Colleges and Experiment Stations, the Office of Experiment Stations of the Department of Agriculture, and the Bureau of Education of the Department of the Interior. The colleges of agriculture may be divided into three classes, according to the general differences in their organization: (1) Colleges having only courses in agriculture; (2) agricultural and mechanical colleges; and (3) colleges (or schools or departments) of agriculture in universities. The Massachusetts Agricultural College is the only purely agricultural college in this country. Twenty-seven States and Territories have agricultural and mechanical colleges, and in twenty the courses in agriculture are connected with the State universities. Harvard University also offers courses in agriculture through the Bussey Institution. The college course in agriculture in most of these institutions extends through four years and leads to a bachelor's degree. It varies considerably in different institutions, as regards the requirements both for admission and for graduation. In some cases students are admitted directly from the common schools, while in others the entrance requirements are on a level with those of higher grade colleges. In 1905 there were over 8000 students in the agricultural courses in these colleges. Short courses of a more elementary and practical nature also are given in many of these colleges. Special schools have been organized in a few institutions, notably a dairy school in the University of Wisconsin, and a sugar-makers' school at New Orleans, in connection with the Louisiana State University. Various forms of university extension work in agriculture are largely engaged in by these colleges, through the farmers' institutes (see Farmers' Institute) and home reading courses, and, broadly speaking, through the publications of the experiment stations.

Schools of agriculture of secondary or high-school grade are maintained in Alabama, California, Maine, Minnesota, Nebraska, Oklahoma, Rhode Island, Washington, and Wisconsin, either independently or in connection with the agricultural colleges. Instruction in agriculture is given in normal schools in several States, and it is also taught in some private schools.

The laws of over 30 States now permit the teaching of agriculture in the common schools. School gardens and nature study relating to agriculture are being introduced into the common schools, and attempts are being made in a number of States to adapt teaching in this subject to the requirements of the rural schools.

British Empire. A chair of agriculture in the University of Edinburgh was founded and endowed as early as 1790, and a professorship of rural economy was established at Oxford in 1796. A professorship of agriculture has been (1899) founded in the University of Cambridge. The Albert Institution at Glasnevin, near Dublin, has existed since 1838, and the Royal Agricultural College, Cirencester, since 1845. Among the important centres of agricultural education in Great Britain are the Glasgow and West of Scotland Technical College, Glasgow; the University College of Wales, Aberystwith; the Durham College of Science, Newcastle-on-Tyne; and the University of Aberdeen. Grants of money for agricultural education are made through the board of agriculture. Instruction in agriculture is given in a number of the rural schools. There are also traveling schools equipped with modern dairy apparatus.

In Canada, the agricultural college at Guelph, Ontario, is a very successful institution. There are a number of secondary schools of agriculture in Quebec and Nova Scotia, and there is a dairy school in New Brunswick.

Agricultural colleges have been established at Truro, Nova Scotia, and Winnipeg, Manitoba. A royal establishment has been incorporated in the Province of Quebec to maintain two or more agricultural schools and experimental farms in the Province. Sir William Macdonald has established and endowed the Macdonald Foundation for Rural Education, near Montreal.

The Imperial Agricultural College of India, endowed with $150,000 by Henry Phipps, of Pittsburg, Pa., and receiving financial support from the Imperial treasury, is situated at Pusa, and includes a college, experiment station, and cattle-breeding farm.

In Australia, there are agricultural colleges at Gatton, Queensland; Richmond, New South Wales; Roseworthy, South Australia; and Dookie and Longerenong, Victoria. Agricultural instruction is also given by traveling experts attached to the colonial departments of agriculture. In New Zealand is the Canterbury Agricultural College at Lincoln, and in Cape Colony there is a school of agriculture at Elsenburg.

France. An elaborate system of agricultural education is maintained under the auspices of the national government. At the head of this system stands the *Institut National Agronomique* at Paris, in which instruction of university grade is given in agricultural science, supplemented by laboratory and field practice. Next in order are the national schools of agriculture, in which theoretical and practical instruction are combined. These are at Grignon, Rennes, and Montpellier. A third class includes the secondary agricultural schools for the children of farmers, who receive theoretical and practical instruction under competent agriculturists, and at the same time perform all the work necessary to carry on the school farm. In many of these schools general agriculture is taught, but some are devoted to special lines, such as viticulture, dairying, or irrigation. Another and older kind of agricultural schools comprises those in which a system of apprenticeship is employed. On the completion of his term, the student receives a small sum of money as compensation for his labor. These schools are no longer popular, and have materially decreased in number.

Since 1879, instruction in the elements of agriculture, horticulture, and natural history has been obligatory in the normal and primary schools of France. In each department of the country a professor of agriculture is appointed to prepare a course of instruction in agriculture for the normal school, to hold farmers' meetings for the dissemination of information regarding improved agricultural methods, and to maintain model fields of demonstration. Besides, chairs of agriculture have been established in many lyceums and colleges throughout France. Important special schools are the dairy school at Mamirolle, the school of agricultural industries at Douai, the school of horticulture at Versailles, and the school of horse breeding at Le Pin.

BELGIUM. Belgium has a system somewhat similar to that of France, but in some particulars more thoroughly organized. At the head of this system are the Agricultural Institute of Gembloux and the University of Louvain. General and special agricultural schools of secondary grade have been established for young men and young women, and courses of instruction in agriculture are given in public and private schools of secondary grade. Courses in agriculture are given in the normal and primary schools also; numerous courses of lectures are provided for adult farmers in various parts of the country, and a corps of government agriculturists is charged with disseminating information, and in various ways promoting the instruction of farmers in improved methods of agriculture.

OTHER EUROPEAN STATES. Germany has no uniform system of agricultural education. Higher courses are maintained in agricultural institutes, and professorships are connected with many of the universities, e.g., those at Königsberg, Breslau, Halle, Göttingen, Leipzig, Rostock, and Jena. The Agricultural High School at Berlin, the Agricultural Academy at Poppelsdorf, the Technical High School at Munich, and the Forestry Academy at Tharandt are important institutions. There are also numerous general and special courses in agricultural subjects in schools of lower grade.

Agricultural education is being actively fostered by the government of Austria-Hungary, where more than 150 institutions of different grades devoted to general and special instruction in agriculture have been established. The subject is taught in the rural elementary schools and also by a corps of traveling instructors maintained by the government.

Italy has agricultural colleges at Milan and Portici, about thirty general and special schools of secondary grade, and a recently organized system of elementary education under direction of the ministry of public instruction.

Denmark is giving much attention to the general and technical education of the agricultural population. There is an agricultural college at Copenhagen, and there are a number of agricultural schools which receive financial aid from the government. The Royal Agricultural Society of Denmark promotes agricultural education through meetings, publications, and the services of dairy and veterinary experts, payment of expenses for agricultural journeys, and the placing of apprentices on farms.

Sweden has agricultural colleges at Ultuna and Alnarp, 26 secondary schools, several dairy schools, instruction in normal and primary schools, and a corps of traveling instructors. There is a similar system in Norway, the college being at Aas.

The Russian system of agricultural education is organized for the most part under the ministry of agricultural and imperial domains, and includes agricultural institutes at the universities of Kazan, Kiev, and Moscow, similar institutions at Novoya Alexandria, Riga, St. Petersburg, and Mustiala (Finland), secondary schools, and elementary courses in the public schools.

AGRICULTURAL EXPERIMENT STATION. An institution, or department of an institution, devoted to scientific and practical investigations for the benefit of agriculture, the inspection of materials, animals, and plants used in or injurious to agriculture, and the dissemination of information on the theory and practice of agriculture. They grew out of the chemical studies of such men as Liebig in Germany, Boussingault in France, and Lawes and Gilbert in England during the first half of the nineteenth century. Systematic investigations in agriculture were begun by Lawes and Gilbert at Rothamsted, England, in 1843. The first experiment station organized as a public institution was established in 1851 at Möckern, near the city of Leipzig, Germany, and under the influence of Leipzig University. In the United States the first stations were established at Wesleyan University, Middletown, Conn., by the State of Connecticut, in 1875, under direction of W. O. Atwater, and about the same time at the University of California, Berkeley, Cal., by the university, under direction of E. W. Hilgard. Previous to this, agricultural investigations had been carried on at Yale University under professors S. W. Johnson and William H. Brewer, and at agricultural colleges in several States. Agricultural experiment stations are now maintained in nearly all the countries of the world, and are usually under the patronage of general or local governments. They are most completely organized in the United States, France, Germany, Belgium, Holland, Austria-Hungary, Denmark, Japan, Sweden and Norway, Switzerland, and Russia. They are conducted on various plans in all parts of the British Empire.

ORGANIZATION. In the United States there were in 1905 fifty-seven stations, receiving annually $720,000 from the National Government under the Hatch Act of 1887, and more than $800,000 from State governments and other sources. They employed about 850 persons in administration and inquiry, and issued that year 403 annual reports and bulletins, which are sent through the mails under frank to more than 725,000 addresses. With few exceptions, they are departments of the agricultural colleges established under the land-grant act (Morrill Act) of 1862, and are independent of each other as regards the planning and conduct of their operations. They are united in a national system through the Association of American Agricultural Colleges and Experiment Stations and the Office of Experiment Stations in the United States Department of Agriculture. This office exercises supervision of their expenditures from the national fund, and gives them advice and assistance in many ways. It summarizes the accounts of the work of the stations and kindred institutions throughout the world in the periodical known as the *Experiment Station Record*, and gives popular *résumés* of their investigations in the *Farmers' Bulletins* series of the department, under the general title of *Experiment Station Work*. It also directly manages the stations in Alaska, Hawaii, and Porto Rico, for which the National Government appropriated $45,000 ($15,000 for each station) for the fiscal year ended June 30, 1905.

FUNCTION. The operations of the stations cover a wide range of scientific and practical work relating to every branch of agriculture and horticulture, and including original investigations, verification, and demonstration experiments, studies of natural agricultural conditions and resources, inspection and control service, and dissemination of information. Practically all the stations are keeping meteorological records, and ten are making special studies of problems relating to meteorological phenomena and climatic conditions. Thirty-six stations are investigating soils, their geology, physics, and chemistry, or conducting soil-tests with fertilizers or in other ways. Twenty-one stations are studying questions relating to drainage and seepage, or to irrigation in the field or greenhouse, and also irrigation of orchard, garden, or farm crops. Thirty-three stations are making analyses of commercial and home-made fertilizers, or are conducting field experiments with fertilizers. At least fifteen stations either exercise a fertilizer control in their respective States or make analyses on which the control is based. All the stations are studying the more important crops, either with regard to their composition, nutritive value, methods of manuring and cultivation, and the best varieties adapted to individual localities, or with reference to systems of rotation.

Forty-seven stations are investigating the composition of feeding-stuffs, making digestion experiments, conducting feeding experiments for milk, beef, mutton, or pork, or studying different methods of feeding. Twenty-nine stations are investigating subjects relating to dairying, including the chemistry and bacteriology of milk, creaming, butter-making, or the construction and management of creameries. Studies on the food and nutrition of man, including the composition and digestibility of foods and metabolism, are being conducted at fourteen stations. Fifty-two stations are doing chemical work, and often are studying methods of analysis. Botanical studies occupy more or less of the attention of forty-seven stations, including investigations in systematic and physiological botany, with special reference to the diseases of plants, testing of seeds with reference to their vitality and purity, classification of weeds, and methods for their eradication. Fifty-three stations work to a greater or less extent in horticulture, testing varieties of vegetables and large and small fruits, and making studies in varietal improvement and synonymy.

Several stations have undertaken operations in forestry. Thirty-six stations investigate injurious insects with reference to their restriction or destruction. Twenty-four stations study animal diseases and the methods for their prevention or cure. At least five stations are engaged in bee culture, and eight in experiments with poultry. One or more stations have made investigations on miscellaneous subjects, such as the following: Technology of wine, olive oil, cider, and vinegar; preservation of fruits and vegetables; the draught of farm implements; road-making; the manufacture of beet, cane, sorghum, and maple sugar; oyster culture, etc. For the history and present status of the stations in the United States see *Office of Experiment Stations*, Bulletin 80, p. 636.

British Empire. In England, the most important station is that established in 1843 by Sir John B. Lawes, at Rothamsted, with his own funds, and continued with a trust fund of £100,000. This station has done very valuable work on fertilizers and the nutrition of plants and animals. Agricultural researches are also carried on at the agricultural colleges at Aspatria, Cirencester, Downton (Salisbury), Uckfield, and Wye, Yorkshire College (Leeds), University College (Nottingham), University Extension College (Reading), Durham College of Science (Newcastle-upon-Tyne), University Botanic Garden (Cambridge), Royal Botanic Gardens (Kew), and under the auspices of the Board of Agriculture, the Royal Agricultural Society of England, the Bath and West and Southern Counties Society, and a number of county education committees and councils.

In Scotland, similar work is done by the Royal Highland and Agricultural Society of Scotland, the Agricultural Research Association of the North Eastern Counties, the Royal Botanic Garden at Edinburgh, Mareschal College of Aberdeen University, and the Glasgow and West of Scotland Technical College; in Ireland, by the Royal Dublin Society, Glasnevin Agricultural College, and Trinity College Botanic Gardens (Glasnevin); in Wales, by the University Colleges of Wales and North Wales. In Canada, the principal stations are the Central Experimental Farm at Ottawa, with branches in British Columbia, Northwest Territory, Manitoba, and Nova Scotia, and the station at the Agricultural College of Guelph, Ontario. In the British West Indies, stations for the improvement of sugarcane are maintained on Barbadoes, Antigua, and Trinidad, and botanical stations on these islands and on Dominica, Grenada, Montserrat, St. Lucia, St. Vincent, and Tobago, under the Imperial Department of Agriculture for the West Indies, and at Jamaica by the Department of Public Gardens and Plantations. In Cape Colony, there is a government laboratory and herbarium at Cape Town, and a station at the agricultural schools at Elsenburg. In India, there are more than forty stations—farms and botanic gardens; in Australia, over thirty; and in New Zealand, eleven.

Europe. Germany has nearly one hundred stations, many of which are connected with universities. A considerable number of stations maintain inspection and control of fertilizers, feeding-stuffs, and seeds; others are for investigations in special subjects, such as brewing and distilling, milling, animal chemistry or physiology, veterinary science, dairying, plant diseases, and plant physiology. Among the most important German stations are those at Berlin, Halle, Bonn, Breslau, Darmstadt, Munich, Göttingen, Bernburg, Möckern, Poppelsdorf, and Tharandt. France has about 70 stations and laboratories, of which the best known are those at Grignon, Juvisy, Montpellier, Paris, and Versailles. Austria has 41 stations; Belgium, 15; Denmark, 10; Holland, 18; Hungary, 16; Italy, 22; Switzerland, 13; Norway and Sweden, about 45; Russia, more than 100; and Japan, 58. In all there are about 800 experiment stations in the world.

An address list of the agricultural experiment stations of the world is published annually by the Office of Experiment Stations, United States Department of Agriculture (Washington, D. C.).

AGRICULTURAL LA'BORERS. See Labor Problem; Gangs, Agricultural.

AG'RICUL'TURE (tilling of land, Lat. *agri*, gen. of *ager*, field, + *cultura*, tilling, cultivation). In a broad sense of the word, the science and art of the production of all plants and animals useful to man. More or less intimately connected with agriculture itself has been the preparation of its products for man's use. Again, the spinning of fibres and the weaving of cloth, the tanning of leather, the making of butter, cheese, wines, cider, vinegar, etc., have been largely done by farmers. Gradually, however, these occupations have been specialized and removed wholly or in part from the farm. Thus, the production of forest trees has been specialized as forestry, and the production of fruits, vegetables, and ornamental plants has formed the subject of horticulture. Such occupations as breeding live stock, raising poultry, bee-keeping, and fish culture are also pursued independently of general agriculture. The term agriculture has, therefore, been gradually restricted to the production of a limited group of plants and animals, such as may be brought together on single farms in a system of mixed husbandry. The particular animals and plants included in agriculture in this narrower sense will vary with the region and a variety of circumstances. For example: in some regions the sweet potato is raised in a small way in gardens and is there considered a horticultural plant, while in regions where it is raised in large fields it is considered an agricultural plant. In the present article the term agriculture will be used in a somewhat broad sense, and the sketch will be confined to a brief outline of the historical development of agriculture, general statistics of a few of the more important agricultural products, and references to parts of the more general literature of agriculture. Information regarding particular plants and animals, or special agricultural industries, may be found in other articles in this Encyclopædia.

THE EARLIEST AGRICULTURE. Agriculture began in prehistoric times, when primitive man first began to select particular plants in his immediate environment as preferable to others for his use as food or for making his clothes, and when he first directed his efforts toward promoting the growth of plants. Whether these attempts preceded those to capture and confine animals, with a view to employing them as beasts of burden, or to using their meat, milk, or skins, we do not know. It is, however, clear, that while the migratory habits of savage tribes must have tended to hinder anything like systematic cultivation of the soil, they probably did not prevent the domestication of animals.

The practices of some aboriginal tribes at the present time indicate that efforts to promote the growth of useful plants by the removal of other plants growing among them antedates the planting of seeds. Similar evidence points to the beginning of agricultural implements in the use of pointed and forked sticks to scratch the soil or remove obnoxious vegetation. The union of two such sticks with a leathern thong made a rude mattock or hoe, and a larger implement of the same kind formed the primitive plow, which was drawn, very likely, at first by men and afterward by domesticated animals. The great burden of agricultural labors was in those early ages undoubtedly thrown upon woman, as has been the case among the tribes of North American Indians, whose men have devoted themselves almost exclusively to the chase and to war. It is interesting to observe that severe military requirements still necessitate the employment of women in field labor on the continent of Europe.

EGYPTIAN AGRICULTURE. In tracing the development of agriculture in historical times we naturally turn first to Egypt, the motherland of our civilization. The records preserved on ancient monuments allow us to trace the history of agriculture in Egypt back to at least 3000 B.C. At that early time various animals had already become domesticated, and the growing of crops for man and beast by a regular system of tillage and irrigation had been united with the feeding of large numbers of animals on the ranges. There was, however, no fixed distinction between wild and domesticated animals, and with certain kinds of animals the limits of domestication had not been definitely settled. The land and live stock were very largely the property of the royal, priestly, and military classes; the care of animals and the performance of farming operations were in the hands of hired laborers or slaves. Agriculture was, however, a more honorable occupation than trading or the mechanical arts. Herdsmen and fishermen were in the lowest class; swineherds especially were despised. Cattle, sheep, goats, and swine were kept, often in large herds and flocks. The cattle belonged to the same species as the present cattle of India. Both bulls and cows were used for labor, but the flesh of the males only was eaten. Sheep were kept for both wool and milk (from which cheese was made), but do not appear to have been often used for food. Goats seem to have furnished the principal milk supply of ancient Egypt. Swine were raised in large numbers, though they were considered unclean and were forbidden food except on certain days or for the priests. The donkey and camel were the principal beasts of burden from prehistoric times. The donkey was probably first domesticated by the ancient Egyptians, being taken from the wild asses which came from their home at the headwaters of the Nile. Horses were brought into Egypt about 1900 B.C., when the Shepherd Kings from Asia conquered the country. The stallions only were used for war and for shows. They were kept in stables and fed on straw and barley. Water fowls, especially geese, were abundantly raised. Breeding of animals by selection was customary, as well as branding them for identification. "When the Nile overflowed, animals of all kinds were placed upon artificial raised ground, and fed upon wheat straw and leguminous fodder raised for the purpose.

Crops were grown with the aid of the alluvial deposits annually made by the overflowing Nile and of irrigation to supply the lack of rainfall. Irrigation water was taken from the Nile and distributed through numerous canals and ditches. The water was raised to the top of the river bank by handsweeps such as are often used on farms to-day for raising water from shallow wells, or by means of a vessel held with straps between two laborers, who pulled against each other in lifting the water. In some cases seed was sown after the Nile flood without preparation of the land, and was trodden in by animals. Generally, the plow or the hoe was used. The plow consisted of a wooden plowshare, double handle, and draught pole or beam. "The beam and stilt were fastened together by thongs or by a twisted rope, which kept the share and beam at a proper distance and helped to prevent the former from penetrating too deeply into the earth." The plow was drawn by two bulls or cows, yoked by the shoulders or attached by the horns. Generally, one man held the plow and another drove the animals, but sometimes one man performed both duties. The hoe was made of wood, and consisted of a rounded or pointed blade attached to a handle by a twisted thong. Other tillage implements sometimes used were the harrow and the roller. The cereals grown were bearded wheat, six-rowed barley, durra (*Sorghum vulgare*, var.), and millet (*Panicum miliaceum*). The seed was sown broadcast; the wheat and barley in November, after the subsidence of the Nile flood, and the durra either at that time or in April. Wheat was harvested in March, barley in April, and spring durra in July. "Wheat and barley were headed with a toothed sickle, or cut lower down and bound into sheaves." The grain was trodden out by donkeys or oxen on earthen thrashing-floors constructed in the open field, where the chaff was fanned out by the wind. Granaries, often built of the Nile mud, were used for storage. Durra was pulled up by the roots, and the seed was removed with a comb-like stripper similar to that sometimes used now for removing broom-corn seed. Flax was raised from prehistoric times for its fibre, from which the clothing of the ancient Egyptians and the wrappings of the mummies were largely made. It is doubtful whether cotton was grown in Egypt in very ancient times, though it seems to have been introduced there from the East previous to the beginning of the Christian era. Lentils, lupines (*Lupinus ternis*), onions, garlic, and radishes were commonly raised vegetables. The horse bean (*Faba vulgaris*), chick pea (*Cicer arietinum*), and chickling vetch (*Lathyrus sativus*) were also probably raised. For fruits the Egyptians had grapes, olives, figs, pomegranates, and dates. Other cultivated plants were the watermelon and castor-oil plant.

Babylonia. Of Babylonian agriculture there are few records. As in Egypt, it supported a dense population. The Euphrates overflowed, but did not do the work of the Nile. In all the region irrigation turns desert lands into fruitful fields. Of such fields Herodotus said: "This is of all lands with which we are familiar by far the best for growth of corn. When it produces its best it yields even three hundredfold. The blades of wheat and barley grow there to full four fingers in breadth; and though I well know to what a height millet and sesame grow, I shall not mention it, for I am well assured that to those who have never been in the Babylonian country what has been said respecting its productions will appear incredible."

Palestine. The Scriptures are full of allusions to the operations of the husbandman in Palestine, as well as in Egypt. The operations in the two countries necessarily formed striking contrasts, the crops in the former being dependent on the rains for growth, in the latter upon the inundations of the Nile. The Hebrews, before their sojourn in Egypt, had been a semi-pastoral people, and they must have learned something of Egyptian agriculture during the years of bondage. Their laws were those of an agricultural people. Land was practically inalienable. Extensive plains of fertile soil yielded the finest wheat. The hill-sides were covered with vines and olives, often planted in terraces formed with much labor to afford a large mass of soil in which the plants might flourish in the almost rainless summer. The valleys were well watered, and afforded pasture for numerous flocks. Of the smaller cultivated plants, millet was the chief summer crop, but it was cultivated to only a limited extent, being confined to those spots that could be artificially watered. Wheat and barley were the chief cereals, as the winter rains were sufficient to bring them to maturity.

Greece. From the Grecian literature covering the period from 1000 B.C. to the conquest of Greece by Rome, 146 B.C., we get comparatively little definite agricultural information. In addition to the animals used in Egypt, mules were grown and used for labor. In winter, animals were housed. Swarms of bees were commonly kept. Wheat and barley were the cereals, and hemp, as well as flax, was raised. The fruits of Egypt, except the date palm, were grown, and in addition, cherries, plums, almonds, pears, apples, and quinces. The list of vegetables is also lengthened, and includes turnips, beets, cabbage, lettuce, chicory, garden peas, and kidney beans. The common lupine (*Lupinus albus*) took the place of the species grown in Egypt, and is said to have been used for green manuring. It is asserted that the Greeks introduced the use of manure to promote the growth of crops.

Rome. Roman agriculture has received special attention because so much was written about it by the Romans themselves, and because they carried it into other countries, where it modified or dominated agricultural customs. When Rome was only a colony on the Tiber, land was divided among the citizens in small allotments. There was a domain of public land, which was continually extended by the conquests of neighboring States and the partial confiscations that followed. Although land in the conquered territory was sometimes granted to the poorer citizens, there were large tracts of public lands that were either cultivated or allowed to remain in pasture. The common conditions were that the occupants paid one-tenth of the produce of the corn lands, one-fifth of the produce of vines and fruit trees, and a moderate rate per head for cattle pastured. The occupants were merely tenants at will, and theoretically the state could resume or sell the lands at any time. Yet the right of possession was good against all until the lands had been resumed; and in process of time there came to be families so long in possession that they could not be dispossessed. Only the wealthy had the cattle or slaves that made such occupation possible. The burdens upon these occupiers of the public lands were much less than those upon the small farmers who owned their farms. Thus, at least two classes of cultivators were in existence, the small proprietors and the wealthy tenants holding the lands of the State. An addition to the strife between these two classes was the pressure brought to bear in the interest of the landless. Even after the Romans became masters of all Italy, little more than four acres was assigned to each citizen, and the domain lands increased enormously. Attempts were constantly made to restrict the extent of land that could be occupied by the wealthy, but generally without effect. (See AGRARIAN LAW.) A great deterioration and a consequent agricultural change took place during the century that followed the first Punic War (ended B.C. 241). The place of the small farmer was taken by the planter, who cultivated a great extent of territory, using slave labor. The small proprietors either sold their no longer profitable farms or were driven from them by the large land-holders. In Sicily, the first province, and in the others successively, the ownership of the land was vested in the Roman people. From these provinces came the tribute of grain that made grain-raising unprofitable in Italy. Hence, the large estates were gradually given over to the keeping of flocks and the raising of cattle. Among the Roman writers upon agriculture were Varro, Columella, and Pliny. Earlier than these in time and more celebrated was Cato the Censor (died 149 B.C.), who gives us not only the most minute particulars regarding the management of the slaves on his large Sabine farm, but also all the details of husbandry, from plowing to the reaping and thrashing of the crop.

Horses, asses, mules, cattle, sheep, and swine were raised by the Roman farmers, and much attention was given to the breeding of animals for special purposes. Castration was customary, and oxen were the principal work animals used on the farm. Mules were extensively used, especially as beasts of burden. The milk of sheep and goats was generally used for drink, and also for making cheese. Columella describes a method of making and preserving cheese, and says that the milk used in cheese-making was curdled in various ways, but commonly with a lamb's or kid's rennet. Poultry culture was an elaborate industry, and included the raising of hens, geese, ducks, teals, pigeons, turtle-doves, swans, and peacocks. Much attention was also given to fish culture, and such animals as hares, snails, and dormice were raised in considerable numbers. Wheat was the most important cereal crop cultivated by the Romans, and both smooth and bearded varieties were raised. Six-rowed and two-rowed barley, too, was grown to a considerable extent. Millet was grown to some extent. Oats and rye were introduced in comparatively late times. Land given to grain was fallowed for the whole of every alternate year. One-third of the fallow was manured and sown with some green crop, as cattle food. Fallow received from four to five furrowings before the wheat was sown in the fall. The crop of wheat ripened about the middle of June, but the summers were too dry for the raising, with certainty, of millet and other summer crops. Alfalfa (lucerne), common vetch (*Vicia sativa*), chickling vetch, and chick pea were grown for fodder. Hemp, flax, beans, turnips, and lupines also are mentioned as occasionally cultivated. To the list of fruits and vegetables produced in ancient Egypt and Greece the Romans added apricots, peaches, melons, and celery. Meadows were carefully prepared, and rotation of crops was practiced to a certain extent. The soil was thoroughly cultivated with the plow and harrow or the hoe and rake; blind and open drains were used; in some regions irrigation was employed. Manures of different kinds were abundantly used, and various methods for their preservation and distribution were elaborated. Wheat and barley were usually reaped with a sickle, but sometimes they were pulled up by the roots, or the heads were cut off with shears. They were thrashed with flails or with a board studded with iron spikes or sharp flints, which was drawn over the straw, or by trampling with cattle or horses. The Romans carried their agriculture into the ruder countries conquered by them. The vine growing wild in Sicily was carried into Gaul, where it was acclimated with difficulty. To the rude Britons the Romans taught agriculture so successfully that before the period of occupation was over they were exporting large quantities of grain.

The Dark Ages and the Middle Ages. The deterioration of Roman agriculture was accelerated by the overthrow of the Roman Empire. The conquering nations had advanced but little beyond the pastoral stage. During the following period of the Dark Ages the two influences working for the benefit of agriculture in Western Europe were the Saracen in Spain and the religious houses in the other countries. The Saracens irrigated and tilled with untiring industry. They introduced the plants of Asia and Africa; cultivated rice, cotton, and sugar, and covered the rocks of Southern Spain with fruitful vines. In general, throughout Western Europe, land was cheap, and many worthless tracts were given to the Church. In some of the religious orders labor with the hands was imposed upon the members. They studied the works of the Roman writers upon agriculture, and soon had the best cultivated lands in those countries through which their influence extended. Charlemagne encouraged the planting of vineyards and orchards. On the whole, the Crusades helped the agriculture of Western Europe. In the latter part of the Middle Ages the people of the low countries of Western Europe came to be as distinguished for their agriculture as for their commerce and manufactures. They plowed in green crops; the people of Holland developed dairying; the Flemings gained the reputation of being the oldest practical farmers. Also in the plain of Northern Italy, watered by the Po, agriculture was in an advanced condition. A large part of it, of great natural fertility, drew forth the praises of Polybius, who visited it about fifty years after it came into the hands of the Romans. In the thirteenth and fourteenth centuries, under the influence of irrigation, the region became a garden, supporting a large population and exporting grain. In the England of the same period the agriculture showed alternations of indolence and bustle, of feasting and semi-starvation. In August, 1317, wheat was twelve times as high in price as in the following September. Rye was the breadstuff of the peasantry. Little manure was used. Oxen, not horses, were used for teams. In the fourteenth century serfdom disappeared from England, and the tenant farmer became established. "Between 1389 and 1444 the wages of agricultural laborers doubled; harvests were plentiful; beef, mutton, pork became their food; sumptuary laws against extravagance of dress and diet attest their prosperity" (Prothero). Laborers without food could earn a bushel of wheat in two days and a half; of rye in a day and a half.

By the beginning of modern history, the fruitful lands of Western Asia and Southeastern Europe, swept by wars and desolated by conquest, had been placed under the ban of the Turk. The conquest of the Moors in Spain and their subsequent expulsion caused an injury to the agriculture of the peninsula which has not been repaired. The discovery of the New World showed two grades of agriculture carried on by those who had never seen the horse and were practically without domestic animals. Even the careful tillage of the ancient Peruvian had no influence upon Europe and little upon the America of succeeding centuries. The great contribution of America to the world's agriculture was the three plants, the potato, tobacco, and Indian corn or maize. In the region north of Mexico the labor of planting and caring for the scanty crops was performed by the women, who broke the ground with the rudest possible implements.

ENGLAND. In the sixteenth century agriculture in England became more profitable, inclosures were made, and the rights of common were greatly restricted. Hops were introduced from Holland. Turned from the former wool exportation, the farmers began to raise wheat in large quantities to be sent out of the country. A law in the middle of the century practically prevented grain exportation and turned wheat lands into pasturage. The resulting high price of food and the destitution on the part of laborers brought another reaction, and a replowing of grazing lands. The sixteenth century saw the end of the villeinage. In 1595, laborers without food during the summer months worked six days for a bushel of wheat, four days for a bushel of rye, and three and one-half days for a bushel of barley. Gardening, greatly neglected in the first part of the seventeenth century, received due attention in the latter part. Deep drainage, too, began to be talked about. From the middle of the seventeenth century to the nineteenth, England looked to Flanders for the perfection of careful tillage. From the Flanders of the seventeenth century Sir Richard Weston brought turnips and red clover, and Arthur Young afterward called him a greater benefactor than Newton. By the end of the century turnips and clover were extensively cultivated in alternation with wheat. The cultivation of grasses was begun in this century with the introduction of perennial rye grass. White clover was introduced in 1700, and timothy and orchard grass came to England from America about 1760. The eighteenth century saw revolutions in English farming. One came when Lord Townsend established the Norfolk system. Under this system of first, wheat; second, turnips; third, barley; fourth, clover and grass, one-half of the land was constantly under grain crops and the other under cattle-grazing. Large numbers of sheep and cattle were fattened on the turnips, and the consumption of roots on the land increased the yield of the barley. The Norfolk system was a success from the beginning. The rental of certain farms increased fivefold, and farmers in special cases made handsome fortunes. Susceptible of many modifications, it has had much to do with the improved agriculture of England. Beans, peas, and vetches were generally grown, often in mixtures with wheat or oats. Hemp was grown for rope-making. The common vegetables were onions, leeks, mustard, and peas, and the fruits were apples, grapes, and plums.

Another revolution came from the breeding experiments of Bakewell, commenced in 1750. To mention a single point, it had taken three or four years to prepare sheep for the market; those bred by Bakewell were prepared for the market in two years. Besides making a reputation and a fortune for himself, he made for others a way since followed in breeding. Jethro Tull, whose book on *Horse-hoeing Husbandry* appeared in 1731, was almost in touch with the methods of the nineteenth century. His theory was that seeds should be sowed in drills, and the spaces between the drills kept thoroughly cultivated. He invented a drill and a horse-hoe. He did not succeed in obtaining a large crop, but successful modifications of the method have since been made.

NORTH AMERICA. The white colonists of North America had much to discourage them as agriculturists; in New England they had the additional drawbacks of long winters and a rocky soil. The colonists in Virginia found both Indian corn and tobacco, the latter fitted to become an article of export. The New England settlers brought with them English modes of farming. From the Indians they learned how to raise corn (maize), breaking the soil with a hoe and manuring with fish. Corn was the great product to be depended upon, although other grains were cultivated, and cattle and sheep increased slowly, fed first upon the native grass, then upon timothy specially fitted for New England soil.

Potatoes began to be raised in the first part of the eighteenth century. The southern colonists, more favored by nature, made less actual progress than those of the North. Even as late as 1790, as we learn from McMaster's *History of the American People*, little progress was made. In New England and New York, as well as farther south, barns were small, implements rude, and carts more common than wagons. In Georgia the hoe was more often used than the plow; in Virginia the poor whites thrashed their grain by driving their horses over it. Throughout the South it was the common practice to grow crops without rotation, and in general manure was thrown away. A little later came the invention of the cotton gin and the beginning of the reign of cotton, with a demand for fresh fields and a disregard of careful tillage. Early in the century the importation of the Spanish merino sheep changed the farming of the North and greatly increased the production of wool.

THE NINETEENTH CENTURY. In the nineteenth century the progress of agriculture was profoundly affected by great general causes, some of which exerted a world-wide influence. Among these were: (1) the application of science to the improvement of agriculture; (2) the revolution in transportation methods through the use of steam power on land and sea; (3) the rapid opening of vast areas of new land in North and South America, Australia, and Africa to settlement, cultivation, and grazing; (4) the invention and extensive use of labor-saving machinery as applied to agriculture; (5) the abolition of serfdom and slavery; (6) the specialization of agricultural industries; (7) the organization of the distribution of agricultural products and their use in manufactures in accordance with the modern business principles governing the organization of other great industries; (8) the establishment of governmental agencies for the promotion of agriculture; (9) the voluntary coöperation of farmers through numerous associations; and (10) the wide dissemination of agricultural information through books, journals, public documents, and farmers' meetings. Scientific studies and experiments for the benefit of agriculture began with the development of agricultural chemistry early in the century. The most widespread practical result of the investigations in agricultural chemistry has been the extensive use of a large number of forms of commercial fertilizers. In more recent years a wide range of successful research on behalf of agriculture has been developed with the aid of the biological sciences, and in the closing years of the nineteenth century investigations in agricultural physics assumed great importance. The marvelous success of scientific effort, largely under government patronage, as applied to dairying and the sugar-beet industry, is one of the notable achievements of that century. Organized scientific research for the benefit of agriculture through experiment stations and kindred institutions has become a regular and permanent agency for the advancement of this art. See AGRICULTURAL EXPERIMENT STATION; AGRICULTURE, DEPARTMENT OF; CATTLE; SHEEP, ETC.

The vital interest of the whole community in the success of agriculture as the great basal industry has been distinctly recognized during the nineteenth century by the widespread establishment of governmental agencies for its promotion. Agriculture has now a definite place in the ministries of almost all the civilized nations of the globe. In Great Britain the Government fosters agricultural interests through a Board of Agriculture. In the United States the Fèderal Government maintains a Department of Agriculture, whose chief officer has had a seat in the President's Cabinet since 1889 as the Secretary of Agriculture. Many of the States, too, have departments, boards, or commissioners of agriculture.

AGRICULTURAL MACHINERY. One of the features of the agricultural history of the past fifty years has been the extensive introduction of machinery. Sowing machines, cultivators, and all the machines that displace the hoe are of comparatively recent invention. As early as 33 A.D., according to Pliny, the Gauls used a cart with projections in front which cut or tore off the heads of grain; but until recent times little effort was made to invent or introduce labor-saving machinery, owing to popular prejudice. The threshing machine was not invented until 1786, and though an attempt was made early in the century to construct reaping machines, but small success was won until the time of Bell, Hussey, and McCormick. (See REAPERS, REAPING.) In the hay harvest, horse power is applied by means of the mowing-machine, the hay-tedder, the rake, and machines for loading and unloading the hay. Another class of machines, as, for example, the one for threshing, deal with the gathered crops. The use of a system of machinery like that applied to dairying has made great changes in certain lines of agriculture. From horse power, too, there has been a partial change to steam power. About the year 1850 the steam plow began to be used in England. One special advantage in the minds of English farmers was the depth to which the soil could be turned; moreover, the engine was utilized for many purposes on the large estates. The great advantage of steam farm machinery in America has been for operations like that of threshing, but the use of steam for this purpose has not proved especially economical. Inproved farm machinery in America has made possible the rapid settling of the new States and the successful gathering of their immense harvests. See HARVEST AND HARVESTING; FARM IMPLEMENTS; IMPLEMENTS, AGRICULTURAL; THRESHING AND THRESHING MACHINES; PLOW, PLOWING. In an article on the progress of agriculture in the United States, Mr. G. K. Holmes, of the Department of Agriculture, states that "the amount of human labor now (1896) required to produce a bushel of wheat from beginning to end is on an average only ten minutes, whereas in 1830 the time was three hours and three minutes. During the interval between these years the cost of the human labor required to produce this bushel of wheat declined from 17¾ cents to 3⅛ cents. In the contrast thus presented the heavy, clumsy plow of the day was used in 1830; the seed was sown by hand and was harrowed into the ground by the drawing of bushes over it; the grain was cut with sickles, hauled to a barn, and some time before the following spring was thrashed with flails; the winnowing was done with a sheet attached to rods, on which the grain was placed with a shovel and then tossed up and down by two men until the wind had blown out the chaff. In the latter year, on the contrary, the ground was plowed and pulverized with the same operation by a disk plow; the seed was sown with a mechanical seeder drawn by horses; the reaping, thrashing, and sacking of the wheat were done with the combined reaper and thrasher drawn by horses, and then the wheat was ready to haul to the granary."

SYSTEM IN FARMING. There is a movement in agriculture to provide for local demands, to take advantage of growing centres of population, to strive for excellence and exact system in place of haphazard methods. The evaporator has broadened the fruit market. The canning industry has utilized fruits and vegetables and saved the agricultural balances in sections. Cold storage, rapid transportation, and the refrigerator car have reduced risks and shortened apparent distances. New Zealand is in the markets of London. Canada and the United States have a profitable apple trade with England. The expenses of transportation have been reduced to a fraction of the previous cost, and thus the wheat lands of Dakota have been laid alongside those of both New England and old England, with gain for the one and with loss for the others. In dairying there has been one of the triumphs of recent agriculture. Specialization, with scientific method and improved machinery, has brought excellence without destruction of the market. Dairy products, in contrast with others, are higher than they were fifty years ago. Carried on largely as coöperative undertakings, creameries and cheese factories (see DAIRYING) have increased in Europe and America. A large industry in England, dairying on the coöperative basis has been on the increase in France. The Netherlands, famous for its careful agriculture, is a leading dairy country. Switzerland and Canada export large quantities of cheese. Denmark no longer competes for the wheat trade. but has become one of the most successful of dairy countries, exporting immense quantities of high grade butter to England.

AMERICA IN RECENT TIMES. The past fifty years have been a period of careful cultivation, though with many exceptions, in America. Thorough drainage and deep plowing, established in England, have been also made American. A great variety of commercial fertilizers are widely used. In the United States alone it is estimated that about 2,000,000 tons are annually consumed. (See MANURES.) The storing of green crops in silos has become common. A great amount of intelligent work has been given to securing plants and trees suited to local conditions in different climates. Numerous varieties of all sorts of cultivated plants have been obtained through selection and otherwise, and in this way the areas devoted to different crops have been greatly extended. In the vicinity of the large cities market gardening has been a profitable branch of agriculture, and has been the culmination of careful cultivation. Somewhat similar to it has been an industry which has developed in the United States under the name of "truck farming," and is carried on in places remote from markets. A large part of the vegetables consumed in the large American cities come from places from 500 to 1500 miles distant. According to a census bulletin, issued in 1891, in the United States, upward of $100,000,000 of capital is invested in this industry; 500,000 acres are given to it, more than 230,000 persons are employed, and the annual return is $76,000,000. The South Atlantic States are largely interested in "truck farming," which, under favorable conditions, is generally very profitable. Other forms of special agricultural industries which have made great progress in recent years are the breeding of animals, fruit culture, poultry raising, and bee-keeping.

Cottonseed, formerly considered very largely a waste product, is now utilized in a variety of forms, and adds largely to the value of the cotton crop. Not only large quantities of oil are made from this seed, but also oil cake and meal for feeding stuffs and fertilizers. Even the hulls of cotton are used for fertilizers, cattle food, fuel, and paper-making.

In speaking of the agriculture of the United States, besides branches touched upon, reference should be made to tobacco, which is grown widely; to the sugar-cane, grown chiefly on the alluvial lands of the Mississippi; to rice, grown profitably in the lowlands of certain Southern States; to the tropical and sub-tropical products of Florida and California, and to the immense flocks and herds of the "ranches" in the mountain region and on the great plains of the western half of the continent.

In the West, since 1880, irrigation has been employed on a large scale in an attempt to reclaim land within the arid belt, a region extending from the centre of Kansas and Nebraska to the furthermost Pacific Coast range of mountains. In that region of scanty rainfall, at present approximately 10,000,000 acres are irrigated, upon which crops valued at $100,000,000 a year are grown. Under the National Reclamation Act reservoirs are being constructed which will provide water for more than 1,000,000 acres, and irrigation is also being extended by private enterprise. Moreover, improved methods of cultivation are making it possible to grow crops by "dry farming" (*i.e.*, without irrigation) on thousands of acres, until recently considered irreclaimable. The success of irrigation in the West has led to a movement in the humid region to reclaim large areas of unproductive land by drainage, and the National Government is beginning to assist in these enterprises. See IRRIGATION; ARTESIAN WELL.

OTHER COUNTRIES. In Europe the cultivation of the sugar-beet has become a prominent industry in Germany, Austria-Hungary, France, and Russia, and of some importance in Belgium and the Netherlands. Germany grows more than one-third of the product, and the four countries more than nine-tenths of it. The vine is of importance in all the Mediterranean region and in favored localities like those along the German Rhine, where vineyards have given an average net return of more than $100 per acre. Italy gives to the vine 9,000,000 acres, and France, with lowest acreage in 1891, and larger before and since, gives on an average 5,000,000 acres. France, also dating its progress from the Revolution, has become one of the richest of agricultural countries, and previous to 1874 was the greatest wheat producing country of the world. It is noted for its small farms and thrifty agricultural class, more than half of whom are land owners. Germany, the greatest potato-producing country of the world, is also a country of varied agricultural production. Austria-Hungary, only about half a century from serfdom, has a government that fosters agriculture, and presents the sharp contrasts illustrated by the steam cultivator on large estates and the wooden plow on small farms. Russia, only thirty years from serfdom, shows agricultural methods in sharp contrast with an immense agricultural production.

The garden of Italy is the Lombard plain, with its more than 1,600,000 acres of irrigated land and its careful systems of cultivation. Besides large crops of wheat, maize, grapes, and olives, Italy produces great quantities of lemons and oranges, and has more than half a million people engaged in raising silkworms. In Spain, despite vines, oranges, olives, and the possibilities of irrigation and a succession of crops, agriculture looks backward to the time of the Moor.

China, with an agriculture unchanged from legendary times, and India are countries in which rude implements are overbalanced by irrigation and garden-like cultivation. With rice as a principal food product, they support a dense population, have a great variety of crops, and are increasing factors in computing the world's supply.

Egypt, under the guidance of England, is producing great amounts of sugar and a high grade cotton.

Australasia has already developed beyond the pastoral stage, and besides cattle and sheep is exporting dairy and other products. In South America, the Argentine Republic is an important factor in the world's agricultural market, with its wheat, wool, cattle, and wine; and Brazil holds a leading place in the production of coffee. In Central America, including Mexico, the raising of cattle and sheep has become a large industry, and the exports of coffee, cocoa, and bananas are important. The West Indies and the Hawaiian Islands produce large quantities of cane sugar.

The following table, prepared under the direction of Mr. John Hyde, statistician of the United States Department of Agriculture, shows the amount of the principal agricultural products of different countries for the year 1900. Although these returns are not complete for all the countries, they furnish interesting data regarding the relative agricultural production of different regions. Of the world's wheat crop of about 2613 million bushels, the United States produces nearly one-fifth. The other chief wheat growing countries are Russia, France, Austria-Hungary, India, Germany, Italy, Spain, and the Argentine Republic. The United States produces three-fourths of the world's maize crop of 2825 million bushels, and more than one-half of the crop of 7535 million pounds of cotton. Russia leads the world in the production of rye, oats, and barley, and in the yield of potatoes it is surpassed by Germany only. Australia, the Argentine Republic, Russia, and the United States are the chief wool growing countries. Outside of the United States most of the cotton is grown in India, China, and Egypt. Tobacco is an important crop in Austria-Hungary, Mexico, Japan, Germany, and France.

AGRICULTURAL PRODUCTS OF THE WORLD, 1900.

	MILLION BUSHELS.						MILLION POUNDS.		
	Wheat.	Corn.	Rye.	Barley.	Oats.	Potatoes.	Cotton.	Tobacco.	Wool (*a*).
AFRICA:									
Algeria	23	....	....	34	5	*b*1	....	10	30
Tunis	6	....	....	7	....	....	....	....	
Cape of Good Hope	2	3	....	1	2	1	....	....	*c*100
Egypt	14	24	....	....	....	....	553	....	3
Several Countries	*m*	*m*	*m*	*m*	*m*	*m*	50	*m*	1
AMERICA:									
Argentine Republic	101	56	....	....	1	*m*	....	*m*	370
Brazil	....	....	....	....	....	....	114	....	2
Canada	44	28	3	23	114	*d*54	....	....	12
Chile	12	8	....	....	....	....	1	....	8
Mexico	15	110	....	*e*13	....	....	32	99	5
Uruguay	7	3	....	....	....	....	....	....	96
United States	522	2105	24	59	809	211	4320	*n*	*f*289
ASIA:									
Central Asia (*g*)	7	....	1	3	6	1	....	....	46
China	....	....	....	....	....	....	600	....	35
India, etc	183	....	....	....	....	....	1413	....	85
Japan	20	....	35	44	....	8	60	72	....
Siberia	20	....	16	3	35	17	....	....	60
Trans-Caucasia	5	....	....	....	....	....	....	....	
Turkey	30	....	....	....	....	....	40	....	33
Several Countries	....	....	....	....	....	....	347	....	15
Australasia	50	10	....	4	25	26	1	....	510
EUROPE:									
Austria-Hungary	*b*190	142	107	115	193	*e*577	....	*e*104	64
Belgium	12	....	19	3	20	103	....	7	....
Bulgaria	*e*30	38	7	11	8	1	....	8	....
Turkey	20	....	....	....	....	....	....	....	*h*68
Cyprus and Malta	2	....	....	....	....	....	....	....	....
Denmark	4	....	18	22	35	*b*19	....	....	....
France	309	26	64	44	253	453	....	50	104
Germany	141	....	337	138	489	1414	....	*e*71	50
Greece	3	....	....	....	....	....	4	....	....
Italy	120	*b*88	3	7	16	....	....	*b*12	*i*21
Netherlands	4	....	12	4	16	*e*78	....	....	....
Norway and Sweden	6	....	27	18	80	94	....	2	8
Portugal	8	15	5	....	....	....	....	....	13
Rumania	56	*j* 80	6	15	9	*b*2	....	3	....
Russia	*b*396	*b*31	904	233	744	887	....	....	361
Servia	*k*13	*k*10	2	4	10	2	....	2	*l* 11
Spain	105	24	19	55	10	....	....	....	103
Switzerland	4	....	2	1	5	....	....	4	....
United Kingdom	57	....	2	71	170	*b*218	....		(*b*) (*i*) 140

a—Report of S. N. D. North, Secretary of National Association of Wool Manufacturers, 1900.
b—1899.
c—Includes Natal and Orange Free State.
d—Census, 1891.
e—1898.
f—Washed and unwashed.
g—In Russia.
h—Includes Balkan Peninsula.
i—Fleece-washed.
j—Estimated.
k—1897.
l—1895.
m—No data.
n—No estimate.

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In the United States, the British Empire, and most of the countries of Europe, numerous agricultural journals are published. Among the most important are the following: THE UNITED STATES. *The American Agriculturist* (New York); *The American Garden* (New York); *Breeder's Gazette* (Chicago); *The Cultivator and Country Gentleman* (Albany); *The Florida Agriculturist* (Deland, Fla.); *Hoard's Dairyman* (Fort Atkinson, Wis.); *Experiment Station Record* (Washington); *Pacific Rural Press* (San Francisco); *Rural New Yorker* (New York); *Southern Planter* (Richmond, Va.); *Wallaces' Farmer* (Des Moines, Ia.). GREAT BRITAIN. *The Agricultural Gazette* (London); *Farmer's Gazette* (Dublin); *Field, Farm, and Garden* (London); *Farm and Home* (London); *Gardeners' Chronicle* (London). CANADA. *Journal of Agriculture and Horticulture* (Montreal); *Canadian Horticulturist* (Toronto). FRANCE. *Journal d'Agriculture Pratique* (Paris); *La Semaine Agricole* (Paris); *Revue Horticole* (Marseilles). GERMANY. *Deutsche Landwirtschaftliche Presse* (Berlin); *Fühling's Landwirtshaftliche Zeitung* (Leipzig); *Mölkerei-Zeitung* (Hildesheim). AUSTRIA. *Österreichisches Landwirtschaftliches Wochenblatt* (Vienna). ITALY. *Bollettino di Notizie Agrarie* (Rome). DENMARK. *Landmands Blade* (Copenhagen). AUSTRALIA. *Agricultural Gazette of New South Wales* (Sydney); *Queensland Agricultural Journal* (Brisbane); *Journal of Agriculture and Industry of South Australia* (Adelaide).

AGRICULTURE, UNITED STATES DEPARTMENT OF. The department was established as a separate branch of the government in 1862. It grew out of a voluntary distribution of seeds, begun by the Commissioner of Patents in 1836. In 1839, Congress made an appropriation of $1000 "to be taken from the Patent Office fund for the purpose of collecting and distributing seeds, prosecuting agricultural investigations, and procuring agricultural statistics." Small amounts were thus drawn from that fund annually (except in 1840, 1841, and 1846) up to 1854, when the whole amount was reimbursed and a separate appropriation was made for the agricultural work of the Patent Office. That year an entomologist was employed, and in 1855 a chemist and a botanist were added to the staff, and a propagating garden was begun. After separation from the Patent Office, the chief officer of the department was styled Commissioner of Agriculture. He was not a member of the President's cabinet until 1889, when he became Secretary of Agriculture. The first commissioner was Isaac Newton of Pennsylvania, and the first secretary, Norman J. Colman of Missouri, who was also the last commissioner. The succeeding secretaries have been Jeremiah M. Rusk of Wisconsin, J. Sterling Morton of Nebraska, and James Wilson of Iowa. The department is situated in the city of Washington, in a beautiful park of thirty-five acres, between the Smithsonian Institution and the Washington Monument, but is at present inadequately housed. As defined in the act of establishment, the duties of the department are, "to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word, and to procure, propagate, and distribute among the people new and valuable seeds and plants." With the progress of agricultural science, scientific branches have been added, until the department has become one of the greatest scientific establishments in the world. Its administrative functions also have been materially enlarged in recent years. In 1884, the Bureau of Animal Industry was organized, and in 1888, the Office of Experiment Stations. (See AGRICULTURAL EXPERIMENT STATION.) In 1891, the Weather Bureau was transferred from the War Department to the Department of Agriculture, and in 1901 a Bureau of Plant Industry was established by combining several divisions whose work related to plants. At the same time Bureaus of Soils, Forestry, and Chemistry were created to take the place of divisions with the same names. The department issues a great variety of popular, technical, and scientific publications. The *Year-book* (edition 500,000 copies) and the series of *Farmers' Bulletins* are distributed gratis, largely through members of Congress. A monthly list of publications is sent free to all applicants. Other publications are issued in limited editions for libraries, agricultural colleges, and experiment stations, scientific institutions, and persons coöperating in the work of the department; they are also sold by the Superintendent of Documents. Periodical publications of the department are the *Experiment Station Record, Monthly Weather Review*, and *The Crop Reporter*. In 1905 the department issued 1072 different publications; the total number of copies was nearly 12,500,000. For the fiscal year ending June 30, 1906, the appropriation for the department was $6,162,690, exclusive of $720,000 for the agricultural experiment stations.

The present organization and main lines of work of the department are shown in the following table:

ORGANIZATION AND WORK OF UNITED STATES DEPARTMENT OF AGRICULTURE, 1902.

Division.	Scientific and Technical Work.	Administrative Work.
OFFICE OF THE SECRETARY.		Supervision of all public business relating to the agricultural industry; appointment and supervision of Department officers and employees; care of Department grounds, buildings, supplies and other property.

ORGANIZATION AND WORK OF UNITED STATES DEPARTMENT OF AGRICULTURE, 1902.—(*Continued*).

Division.	Scientific and Technical Work.	Administrative Work.
WEATHER BUREAU	Researches in climatology and meteorology.	Forecasting weather; warning against storms and floods; maintenance and operation of seacoast telegraph lines and collection and transmission of marine intelligence.
BUREAU OF ANIMAL INDUSTRY.	Researches on animal diseases, including chemical, bacteriological and zoölogical investigations.	Inspection of import and export animals and vessels for their transportation; supervision of interstate movement of cattle and inspection of live stock and their products slaughtered for food consumption.
	Investigations in dairying, animal breeding and feeding.	
BUREAU OF PLANT INDUSTRY.	Researches in economic botany; collection and maintenance of National Herbarium; purity and vitality tests of seeds.	
	Researches on physiology and diseases of plants; plant breeding.	
	Researches on the natural history, geographical distribution, and utilization of grasses and forage plants	
	Investigation on varieties of fruits, with special reference to their adaptability to various soils and climates.	
	Collection of seeds and plants from foreign countries for testing at the State agricultural experiment stations.	Purchase and distribution of seeds, largely through members of Congress.
	Testing and propagating economic plants.	Care of Department park and conservatories. Management of Arlington Experimental Farm
BUREAU OF CHEMISTRY.	Researches in agricultural chemistry, especially on foods, sugar-producing plants, fertilizers, soils, materials for road making, methods of analysis, etc.	Inspection of imported food products.
BUREAU OF SOILS.	Investigation, survey and mapping of soils; studies in agricultural physics; investigations in curing and fermenting tobacco.	
OFFICE OF EXPERIMENT STATIONS.	Collection and dissemination of information regarding agricultural education and research in the United States and abroad. Investigations on food and nutrition of man and on irrigation, drainage, and farm mechanics	Supervision of expenditures of agricultural experiment stations in the United States; maintenance of experiment stations in Alaska, Hawaii, and Porto Rico.
FOREST SERVICE.	Researches on natural history, and utilization of forests.	Management of forests to demonstrate economic possibilities of rational treatment. Control of National forest reserves and economic management of forests

ORGANIZATION AND WORK OF THE UNITED STATES DEPARTMENT OF AGRICULTURE, 1902. — (*Continued*).

Division.	Scientific and Technical Work.	Administrative Work.
BUREAU OF BIOLOGICAL SURVEY	Researches on geographic distribution of animals and plants; mapping of life zones; studies of food habits of birds and mammals.	The regulation of the introduction of American or foreign birds or animals in localities where they have not heretofore existed. Protection of game by control of interstate trade.
BUREAU OF ENTOMOLOGY	Researches on life history and geographic distribution of insects, and on means of repression of injurious insects. Investigations in apiculture and sericulture.	
OFFICE OF PUBLIC ROAD INQUIRIES.	Collection and dissemination of information regarding road management; experiments in road making.	
DIVISION OF PUBLICATIONS.	Editing of Department publications, especially the Year-book.	Supervision of Department printing and illustrations: distribution of publications.
BUREAU OF STATISTICS.	Collection and dissemination of agricultural statistics, especially monthly crop reports for the United States. Studies of agricultural supply and demand in foreign countries.	

AG'RIGEN'TUM (Lat. name for the Gk. Ακράγας, *Akragas*). The modern Girgenti, a town on the southern coast of Sicily, in lat. 37° 17′ N., and long. 13° 28′ E., founded by a colony from Gela (582 B.C.), and, in the earlier ages, one of the most important places in the island. During the sixth and fifth centuries B.C., under various rulers, among them the tyrant Phalaris, it rose to great power and splendor, having a population of 200,000. It was utterly destroyed by the Carthaginians (405 B.C.), and it never fully recovered. In the course of the Punic Wars, it was compelled to submit to the Romans. From 825 to 1086 A.D. it was in the possession of the Saracens, from whom it was conquered by Count Roger Guiscard. The modern Girgenti had (1901) 25,024 inhabitants, and is the capital of the province of the same name. The ancient walls can still be traced, and there are a number of picturesque remains of temples and other buildings of the Greek period. The best preserved are the temple of Concord and the so-called temple of Hera Lacinia; the largest is the unfinished temple of Zeus.

AG'RIMONY (Lat. *Agrimonia*, for Gk. ἀργεμώνη, *argemōnē*, a kind of poppy). A genus of plants of the natural order Rosaceæ. The common agrimony (*Agrimonia eupatoria*) is a native of Great Britain and parts of Europe, and also is found in the United States, growing in borders of fields, on waysides, etc. It has an upright habit, attains a height of two feet or more, and has interruptedly pinnate leaves, with the leaflets serrate and downy beneath. The flowers are small and yellow, in close racemes. The whole plant has a pleasant, slightly aromatic smell, and is bitter and styptic. A decoction of it is used as a gargle; the dried leaves form a kind of herb tea, and the root has some celebrity as a vermifuge. Very similar to this is Agrimonia parviflora, a native of Virginia, the Carolinas, etc., which has a very agreeable fragrance.

AGRIP'PA. See under Herod.

AGRIPPA, Henricus Cornelius (1486-1535). A cosmopolitan physician, philosopher, and writer, whose genius and learning had a tinge of quackery. He was born at Cologne, September 14, 1486. At the age of twenty, he was sent by Emperor Maximilian on a diplomatic mission to Paris. At twenty-three, he was teaching theology at Dôle, in the Franche-Comté. Here he attacked the monks, who replied with an accusation of heresy. In 1510, he reëntered the diplomatic service, and the next year he attended, as theologian, the schismatic Council of Pisa. In 1515, he lectured at Pavia, where he received a doctor's degree in law and medicine; then, after some years in diplomatic service, he became involved once more in controversy with the Church, for his bold defense at Metz of a woman accused of witchcraft. He practiced medicine at Geneva, Fribourg, and Lyons, and, under pressure of poverty, composed a keen Latin satire on the existent state of science, *A Declamation on the Uncertainty and Vanity of the Sciences and Arts, and on the Excellence of the Word of God* (*De Incertitudine et Vanitate Scientiarum*, etc.) (1527), which furnished new occasion for malicious accusation. In 1529, he quarreled with the queen-mother, Louise of Savoy, and left Lyons for the Netherlands, to become historiographer of the Emperor Charles V., of whose reign he wrote a history. His salary was unpaid, and he was imprisoned and finally banished from Cologne for debt. He found a brief refuge at Grenoble, where he died, February 18, 1535, only to be pursued in the grave by a spiteful epitaph from his Dominican enemies. Agrippa was a man of clear sight and keen wit; but he lacked stability, seriousness, and discretion. His *Works* appeared at Lyons in two volumes (1550). They are analyzed in Henry Morley's appreciative *Life of Agrippa* (London, 1856). Noteworthy are Agrippa's *De Occulta Philosophia* (1510), which gives an account of the Cabbala (q.v.), and *De Nobilitate et Præcellentia Fœminei Sexus* (1532).

AGRIPPA, Marcus Vipsanius (63-12 B.C.). A Roman general and statesman. Though not of high birth, he rose to an exalted position through his own talents. He first married Marcella, the niece, and then Julia, the daughter, of Octavianus (Augustus). He was eminent both in war and in peace; and as a general, counselor, and friend of the Emperor, did good service to him and to the Roman State. As a general, he laid the foundation for the sole dominion of Octavianus, and commanded his fleet in the battle of Actium (q.v.). He was generous, upright, and friendly to the arts; Rome owed to him the restoration and construction of several aqueducts, and the erection of the Pantheon, besides other public works of ornament and utility.

AG'RIPPI'NA. (1) The daughter of M. Vipsanius Agrippa (q.v.) and Julia, daughter of Augustus. She was one of the most heroic and virtuous women of antiquity. She was married to Germanicus (see Germanicus Cæsar), whom she accompanied in all his campaigns. She openly accused Tiberius before the Senate of having hired the murderers of her husband; and the tyrant, who hated her for her virtues and the esteem in which she was held by the people, banished her to the island of Pandataria, near Naples, where she voluntarily died of hunger (33 A.D.). (2) The daughter of the last mentioned, and one of the most detestable women that ever lived. In her second widowhood, she induced the Emperor Claudius, her own uncle, to marry her, and espoused his daughter, though already betrothed to another, to her son Nero. In order to bring the latter to the throne, she ruined many rich and noble Romans, excluded Britannicus, the son of Claudius by Messalina, and finally poisoned the Emperor, her husband. She then endeavored to govern the Empire through her son Nero, who was proclaimed emperor; but her ascendency proving intolerable, Nero caused her to be put to death (59 A.D.). She enlarged and adorned her native city, Cologne, which received from her the name of Colonia Agrippinensis.

AG'ROPY'RON (Literally field-wheat. Gk. ἀγρός, *agros*, field + πυρός, *pyros*, wheat). A genus of grasses including about fifty species, most of which are perennials. A number are native to the western United States, where they are commonly known as wheat grasses, and are held to be valuable for pasturage. Other species are common to Europe and the eastern United States, where *Agropyron repens*, often called couch grass and twitch grass, is a pest to agriculture. It has a long rhizome that roots at the nodes, and if plowed or harrowed it merely breaks up into new plants. Therefore it is hard to eradicate. Upon the Western ranges, however, it is deemed a good hay grass. The habits of the plants enable them to withstand drought, a characteristic that commends them in the large stock regions. Some of the valuable species are *Agropyron caninum*, bearded wheat grass; *Agropyron divergens*, wire bunch grass; *Agropyron pseudo-repens*, western couch grass; *Agropyron spicatum*, western wheat grass; and *Agropyron tenerum*, slender wheat grass. In Australia Agropyron scabrum is considered a good winter grass. Some of the species, as Agropyron repens, are recommended as binder grasses for railroad embankments and other places liable to washouts. The root stalks of Agropyron repens, well known in medicine under the name *Radix graminis*, have diuretic and aperient properties.

AGTELEK, ŏg'tĕ-lĕk, or **AGGTELEK.** A village of Hungary, in the county of Gömör, about 40 miles west-southwest of Kaschau (Map: Hungary, G 2). It is known for its remarkable stalactite cavern, called *Baradla* (steaming-place), the largest in the world after the Mammoth Cave in Kentucky. It is entered through an opening scarcely 3 feet high by 5 feet wide. It consists of a labyrinth of caverns communicating with one another, whose combined length is about five miles. The largest of them is over 900 feet long and more than 90 feet in height and breadth. Many of the stalactitic formations are of singular and fantastic shape, giving rise to the names borne by some of the grottoes, such as the Cathedral, Paradise, Flower Garden, etc.

AGUA, ä'gwȧ. A South American toad (*Bufo* *marinus*), which is the largest toad known, being sometimes eight inches long. It became a pest a few years ago in Jamaica, where it was introduced in 1844 as an enemy to the rats, which were devouring the sugar-cane. It multiplied excessively, and although it destroyed young rats, became a nuisance by its numbers, nocturnal bellowings, and destruction of ground-birds, chickens, and eggs. It has since become less numerous and troublesome. See illustration on Colored Plate accompanying Toad.

AGUA, Volcán de, vŏl-kän′ dā ä′gwȧ. A conical volcanic mountain in Guatemala, Central America (Map: Central America, B 3). It is over 13,000 feet high, and has a crater about 100 feet in diameter, from which streams of hot water are occasionally ejected. Northwest of Agua are situated the volcanoes of Pacoya and Fuego. The old town of Guatemala was destroyed in 1541 by the hot water eruption of Agua.

AGUADILLA, ä′gwȧ-dē′lyȧ. The chief town of the department of the same name (230 square miles, pop., 99,645), situated on the western coast of Porto Rico (Map: Porto Rico, A 2). It has a fine bay and contains an old church and a fort. It was founded in 1775 and unsuccessfully attacked by the British in 1797. Pop., 1899, 6425.

AGUADO, ȧ-gwä′dō, Alejandro María, Marquis de las Marismas del Guadalquivir (1784-1842). A celebrated Spanish financier of Jewish descent. He was born in Seville, and in Paris became one of the wealthiest bankers of modern times. During the Spanish War of Independence he fought with distinction with those who supported Joseph Bonaparte. Exiled in 1815, he went to Paris and engaged in the Cuban and Mexican trade and in banking. Beginning in 1823, he negotiated four Spanish loans, thus saving Spain from bankruptcy. In return, Ferdinand VII. ennobled him and gave him mining and other concessions. He was naturalized in France in 1828, and at his death left a fortune of more than sixty million francs and a splendid collection of pictures.

AGUARÁ, ä′gwȧ-rä′, or **GUARÁ,** gwȧ-rä′ (native name). A Brazilian native name confusingly applied in books to various South American animals, perhaps most strictly to the crab-eating dog (*Canis cancrivorus*) of Guiana. In the valley of the Rio de la Plata Azara's fox-dog is called "Aguará chay," and the maned wolf "Aguará guazu." See Fox Dog, and Maned Wolf.

AGUAS CALIENTES, ä′gwȧs kä′lē̇-ĕn′tȧs. An inland State of Mexico, with an area of 2969 square miles and a population (1900) of 102,416.

AGUAS CALIENTES (Sp., Hot Springs). The capital of the State of Aguas Calientes, 300 miles northeast of Mexico City (Map: Mexico, H 7). It is situated on a plateau 6000 feet above sea level, and is the point of intersection of the roads from Mexico to Sonora and Durango, and that from San Luis Potosí to Guadalajara. Besides the cultivation of fields and gardens, the manufacture of cloth is very considerable, and is carried on by the factory system. It is the scene of a great fair, held at Christmas time each year, and lasting two weeks. The numerous hot springs of the surrounding district give the town its name. Pop., 1890, 32,400; 1900, 35,052.

A′GUE (Fr. *aigu*, from Lat. *acuta febris*, acute, violent fever), *Febris intermittens*. The common name for intermittent, or malarial, fever, and characterized by certain paroxysms. Each paroxysm is composed of three stages. In the first, a cold sensation creeps up the back, and spreads over the body; the patient shivers, his teeth chatter, his knees knock together; his face, lips, ears, and nails turn blue; he has pains in his head, back, and loins. During this stage the temperature rises to 102° or even to 105° F. This condition is succeeded by flushes of heat, the coldness gives place to warmth, and the surface regains its natural appearance. The warmth continues to increase, the face becomes red and turgid, the head aches, the breathing is deep and oppressed, the pulse full and strong. The temperature ranges from 103° to 105° F. The third stage now comes on; the skin becomes soft and moist, the pulse resumes its natural force and frequency, and a copious sweat breaks from the whole body, the temperature falls to the normal, and the patient generally sleeps.

These paroxysms occur at regular intervals. The interval between them is called "an intermission." When they occur every day, the patient has *quotidian* ague; every second day, *tertian;* and when they are absent for two days, *quartan*. There is a *double quotidian* form, in which there are two complete paroxysms in every twenty-four hours. All ages are liable to this disease. For the cause of this disease, see Malaria and Malarial Fever. See Intermittent Fever.

AGUESSEAU, ȧ′ge-sō′, Henri François d′ (1668-1751). A distinguished lawyer and chancellor of France, pronounced by Voltaire the most learned magistrate that France ever possessed. He was born at Limoges, in the department of Haute-Vienne. He received his earliest education from his father, and devoting himself to the study of law, became *avocat-général* at Paris in 1690, and at the age of thirty-two, *procureur-général* of the *parlement*. While holding this office he effected many improvements in the laws and the administration of justice. A steady defender of the rights of the people and of the Gallican Church, he successfully opposed the decrees of Louis XIV. and the Chancellor Voisin in favor of the papal bull *Unigenitus* (q.v.). During the regency, he became chancellor, but after a year (1718) fell into disgrace through opposing Law's system of finance, and retired to his country seat at Fresnes. Returning to office in 1720, he was exiled a second time for his opposition to Cardinal Dubois. In 1727, he obtained from Cardinal Fleury permission to return, and in 1737 he resumed the office of chancellor, in which he remained till 1750. His works have been published in thirteen volumes (Paris, 1759-89, 1819); *Lettres inédites* (Paris, 1823). Consult Monnier, *Le Chancelier d'Aguesseau* (Paris, 1864).

AGUILAR, ä′gē̇-lär′, Grace (1816-47). An English writer of Jewish parentage. She was born at Hackney, and first became known by two works on her own religion, *The Spirit of Judaism* (first published in America, 1842), and *The Jewish Faith* (1846), in the former of which she attacked the formalism and traditionalism of Judaism, and insisted on its spiritual and moral aspects. She also wrote much fiction, more or less of a religious character, of which only the most popular story, *Home Influence* (1847, and about thirty subsequent editions), was published during her lifetime. The further titles include *A Mother's Recompense* (1850), *The Vale of Cedars* (1850), and *The Days of Bruce* (1852).

AGUILAR DE LA FRONTERA, ä′gē-lär′ dā lȧ frōn-tā′rȧ. A town of Andalusia, Spain, in the province of Cordova, occupying the summits and slopes of several low hills on the left bank of the Cabra, an affluent of the Genil, 26 miles south-southeast of Cordova (Map: Spain, C 4). The surrounding country is very fertile, and abounds in vineyards and orange groves. Many of the houses are of three stories, and the town is remarkable for the whiteness of its houses and the cleanliness of its streets. It has several handsome squares, a fine parish church, a monastic church containing examples of many famous Spanish masters, and a dismantled Moorish castle. The chief trade is in corn and wine. There are salt springs in its neighborhood. Pop., 1900, 13,311.

ÁGUILAS, ä′gē-lȧs. A sea-port town of southern Spain (Map: Spain, E 4). It is situated in the province of Murcia, on the Aguilas-Lorca-Murcia Railway. It has a good harbor, and its port forms the chief outlet for the mineral products of the surrounding country. It contains several smelting works. Pop., 1900, 15,753.

AGUILERA, ä′gē-lā′rȧ, VENTURA RUIZ (1820-81). A Spanish lyric poet, called "the Spanish Béranger." He was born at Salamanca, and in 1843 went to Madrid to study poetry and political journalism. Here he occupied important official positions under the liberal ministries. The journals edited or controlled by him were characterized by bold ideas and keenness of criticism; and in these, as also in his *Satyras* and in the poems entitled *Ecos Nacionales*, he endeavors to arouse the masses to a sense of their national dignity. His most important works are the collections of poems entitled *Elegias* (1862); *Armonías y cantares; La Arcadia moderna;* and *Leyenda de noche-buena* (1872). Several collections of his prose writings, which consist mostly of short novels, have been published. An edition of his complete works appeared at Madrid in 1873, and selections from his poems were published under the respective titles, *Inspiraciones* (1865), and *Poesías* (1880).

AGUINALDO, ä′gē-näl′dō, EMILIO (1870—). The leader of Filipino insurrections against Spain and the United States. He was the youngest of three children, and was educated, first, in his native town, and afterward at the College of San Juan de Letrán in Manila. At this institution, which is conducted by Dominican friars, he remained for four years. In course of time he became *gobernadorcillo*, or mayor of Cavité Viejo, and was acting as such upon the outbreak of the insurrection in August, 1896. Owing to his prominent participation in this uprising, he went to Hong Kong, consenting to a permanent exile from the islands on condition of a large payment on the part of Spain. In 1898 he returned to Manila, for the avowed purpose, it was said, of aiding the United States in the war against Spain, and immediately after the battle of Manila organized an insurrection, which soon assumed proportions unparalleled in the history of the archipelago. In this movement he displayed great ability and extraordinary personal magnetism. Of the twenty-six provinces of Luzon, nearly all were soon in open rebellion, and in the course of several months probably 15,000 Spaniards were captured and more than 2000 driven out of the islands. During the campaign Aguinaldo was engaged in considerable diplomatic fencing with the United States. In June, 1898, he organized a provisional government, consisting of officers of his staff, as well as several of his relatives and friends; and in August of the same year this body appointed him generalissimo of the Filipinos and president of the revolutionary government. In July he addressed an appeal to the Powers for the recognition of Filipino independence. In 1899 he assumed the offensive against the United States, beginning operations by an attack upon Manila, February 4-5, in which he was unsuccessful. During 1899 there were a number of severe engagements. Finally, the native troops were so hard pressed by the Americans that Aguinaldo, after repeatedly removing his capital, was compelled to flee to the mountains. Here the fighting was continued with varying success until March 23, 1901, when Aguinaldo was captured by Brigadier-General Frederick Funston at Palawan, province of Isabella, Luzon, and brought to Manila. On April 2, 1901, he formally took the oath of allegiance to the United States.

AGUIRRE, ȧ-gēr′rā, LOPE DE (c. 1507-61). A Spanish explorer in Peru, known as the "traitor" and "tyrant." He was born in Oñate in the province of Biscay, and came to America at an early age. He was in Peru during the period of the insurrections which followed the subjugation of the Incas, and took an active part in most of them. The turbulent spirits who survived these repeated uprisings were finally influenced to join an expedition to search for El Dorado under Pedro de Ursua. They crossed the Andes and started down the headwaters of the Amazon in the early summer of 1560. Aguirre brought about the death of Ursua, and gained great influence over Fernando de Guzman, Ursua's successor. He then forced his companions to renounce their allegiance to Spain and to recognize Guzman as King of Tierra Firme and Peru. He determined to abandon the search for El Dorado and return to Peru, conquer that country, and establish an independent kingdom there. Shortly afterward the newly made king opposed some of his plans, and Aguirre thereupon murdered him, together with his closest friends. Continuing down the Amazon, Aguirre made his way by one of that river's tributaries to the Orinoco, where he built large vessels, in which he sailed to the island of Margarita. He was forced, however, to abandon the plan of fighting his way across Panama and to Peru. Instead, he landed on the coast of Venezuela, marched inland, and was brought to bay and killed at Barquisimeto, early in November, 1561. His last act was to kill his own daughter with a poniard. In a letter addressed to King Philip II., he declared that he had killed twenty persons during the voyage down the Amazon, and the recorded list of those he ordered murdered is more than sixty, including women and priests.

BIBLIOGRAPHY. Simon, *The Cruise of the Traitor Aguirre*, translated by Markham and Bollaert, Chapter XI., Hakluyt Society Publication No. 28 (London, 1861). This account of the expedition was derived from members of the party. Consult also Bandelier, *The Gilded Man* (New York, 1893).

AGUJA, ȧ-gōō'hȧ (from the Spanish *aguja*, a needle or bodkin). A large, voracious garfish (*Tylosurus fodiator*) of the coast of western Mexico, held in great dread by fishermen. The name (also spelled *agujon*) is extended to various related species of the West Indies and neighboring coasts. See NEEDLEFISH.

AGULHAS, ȧ-gōō'lyȧs (Portug. needles), CAPE. The most southern point of Africa, about 100 miles east-southeast of the Cape of Good Hope, in lat. 34° 51′ S., long. 19° 55′ E., with a lighthouse erected in 1849 at an elevation of 52 feet (Map: Cape Colony, F 9). The Agulhas Bank extends along the whole southern coast of Africa. It is 560 miles in length, and opposite the Cape of Good Hope as much as 200 in breadth.

AGUSTIN, ä'gōōs-tēn'. See ITURBIDE, AGUSTIN DE.

AGUSTINA, ä'gōōs-tē'nȧ (?-1857). The "Maid of Saragossa." A *vivandière* in the Spanish army. She distinguished herself during the siege of Saragossa, 1808-09, by heroic participation in several severe encounters with the French. Once she snatched the fuse from a falling cannonier and fired the gun at the enemy, gaining by this act the name of "La Artillera." She was made sub-lieutenant in the Spanish army, and presented with many decorations. Byron sings her praises in *Childe Harold* (Canto i. 54-56).

AGUTAINO, ä'gōō-tī'nō. A Malay people on Agutaino Island. See PHILIPPINES.

A'HAB (Heb. father's brother). King of Israel from 875 to 853 B.C., the son and successor of Omri (I. Kings xvi : 29—xxii : 40). The story of his reign is told at greater length than that of any other monarch, but the narrative, in the opinion of many Bible critics, is derived from two different sources, which differ as to the point of view from which the events in Ahab's reign are viewed. The one represents the attitude of the Yahweh purists, the other a patriotic admiration of Ahab's bravery and vigorous policy, by means of which Ahab succeeded in checking the advance of the Aramaic kingdom, whose seat was at Damascus. This Syrian State, which could easily combine with the enemies of the Hebrews —Moab and Edom more particularly—was the great danger that threatened the very existence of the Israelitish kingdom. Ahab not only held Benhadad at bay, but retained control over Moab, to which the inscription of King Mesha of Moab (see MOABITE STONE) bears witness. No less than three campaigns were waged against Syria. In the first two, Ahab was successful; and in the interval between the second and third, Benhadad and Ahab joined forces to withstand an attack of the Assyrian king, Shalmaneser II. The latter in his inscription mentions Ahab, and places the size of the force furnished by him at 1200 chariots, 1200 horsemen, and 20,000 soldiers. The Assyrian kings were fond of exaggerating, after a victory, the strength of their opponents, and the figures mentioned are probably too high. Shalmaneser met the combination of Palestinian and Syrian forces at Karkar, near the river Orontes, and claims to have gained a great victory. If this be so, the consequences do not appear to have been of any moment, for shortly afterward Assyrian armies are again obliged to undertake an expedition to the west. Shortly after the battle of Karkar, Ahab's relations with Benhadad are again hostile, and he combines with Jehoshaphat, King of Judah, in a movement to crush Aram. The Hebrews, however, are defeated, and Ahab himself is slain. Ahab, while a follower of Yahweh, did not hesitate, in accordance with the tendency shown by vigorous rulers, to seek the help of other powers. His marriage to Jezebel, daughter of Ethbaal, the King of Tyre (see Josephus, *Antiq.*, viii. 13-1), led to the introduction of the worship of Melkart, the Baal of Tyre, as part of the official cult. That Ahab did not regard such an act as hostile to Yahweh is shown by the fact that his children bear names in which Yahweh appears as an element (Jehoram, Ahaziah, Athaliah), but in the eyes of a zealous Yahwist, like the prophet Elijah, such conduct was reprehensible, and a conflict ensues between the king and the prophet. The story of the conflict, which covers chapters xvii-xix. of I. Kings, is embellished with forceful incidents, all intended to bring out the superiority of Elijah and to show Ahab in the light of a wicked and sinful king, which he assuredly was not. It must be admitted, however, that his policy was a purely secular one, and that he was guided by political and not religious considerations in his various acts. So, the severest charge brought against him, his acquiescence in the judicial murder of Naboth, which was brought about by Jezebel, appears in a less opprobrious light if we recall that the question of royal authority was at stake, and that Ahab could not afford to risk his position among his people as their lord and master by yielding to any opposition, however justified, against a royal request. (See JEZEBEL.) The story that the blood of Ahab's body was licked up by dogs is an illustration of the uncompromising attitude toward him by the prophetical writers.

AHANTA, ȧ-hän'tȧ. A portion of the British colony of Gold Coast in West Africa, formerly belonging to the Dutch, who founded the settlement of Axim.

AHASUERUS, ȧ-hăz'ū-ē'rŭs. The name by which two kings of Media and Persia are mentioned in the Bible. One and the best known is the monarch in Esther's days (see ESTHER), who is the same as the Persian king Khshayarsha, corresponding as is now generally recognized to Xerxes (485-465 B.C.): the identity of the other, referred to as the father of Darius the Mede in the Book of Daniel (chapter ix : 1), cannot be determined. The Hebrew form of the name is Achasverosh. See XERXES.

AHASUERUS. (1) The name of the *Wandering Jew* (q.v.), according to one legend. (2) The title of a drama by Edgar Quinet (published 1833) based on the same story.

A'HAZ (Heb., he has taken hold). Son of Jotham, and eleventh king of Judah, who ruled from 736 to 728, though, according to some scholars, his reign lasted till 715 B.C. His rule was marked by disturbances, conflicts with surrounding nations, and innovations in religious rites. Early in his reign Pekah, King of Israel, and Rezin, King of Syria, undertook to conquer the kingdom of Judah, and besieged Jerusalem, but did not take the city (Isaiah vii : 1), though they carried away many captives (II. Chronicles xxviii: 5). Incursions were made by the Edomites and Philistines, and Ahaz asked help of Tiglath-Pileser, King of Assyria (II. Kings xvi : 7, II. Chronicles xxviii : 16-22), who drove out the invaders, but took heavy toll from Ahaz, compelling him to appear at Damascus as a vassal. While there, Ahaz saw an altar, and ordered Uriah, the high priest, to build one like it. On this Ahaz made sacrifices; but he went further. He broke up the sacred vessels, closed the doors of the temple, sacrificed to Syrian deities, and caused his son to pass through the fire to Moloch (II. Chronicles xxviii : 3, 22-26). Isaiah (chapters ii-v) furnishes a sad picture of conditions prevailing in Judea in the days of Ahaz, frivolity, perversion of justice, avarice, oppression, besides infidelity toward Yahweh, being among the charges brought by the prophet against the king and his court. His name appears on the Assyrian monuments under the form Ya-u-ha-zi, from which the conclusion seems justified that the full name of the king was Jehoahaz ("Yahweh has taken hold").

A′HAZI′AH (Heb. sustained by the Lord). The name of two kings mentioned in the Bible. (1) The son and successor of Ahab, and eighth king of Israel, whose reign may be approximately fixed at 853-852 B.C. He followed his father's example in his devotion to the Phœnician Baal. On his accession, the Moabites revolted, refusing to pay tribute, and before he could make preparations to go against them, he fell from a window of his palace. He sent messengers to the god Baal Zebub of Ekron to know the result of his injuries, but the messengers met Elijah, the prophet of Yahweh, on the way, who sent them back with word that the king would surely die (II. Kings, chapter i). Upon his death Joram, his brother, came to the throne. (2) Son of Jehoram and of Ahab's daughter, Athaliah (II. Kings viii: 25-27), the sixth king of Judah, who is called Azariah (II. Chronicles xxii : 6) and Jehoahaz (II. Chronicles xxi : 17). He took part with his uncle, Jehoram, of Israel, in the latter's campaign against Hazael, King of Syria, in which the two kings were defeated (II. Kings viii : 28-29; II. Chronicles xxii : 5). Ahaziah was soon after slain by Jehu (842 B.C.) (II. Kings ix : 27; II. Chronicles xxii : 7-9), after a reign of only one year (II. Kings viii : 26; II. Chronicles xxii : 2).

AHEAD′. See BEARING.

AHIMELECH, ȧ-hĭm′ė-lĕk (Heb., brother of the king). A Jewish high priest who, according to I. Samuel xxii: 11, was the son of Ahitub. Some scholars are of the opinion that he is identical with Ahijah, who is also spoken of as a son of Ahitub (I. Samuel xiv : 3). Melek, "king," being a title of Yahweh, it might be used interchangeably with *Jah*, but it seems more plausible to assume that Ahijah and Ahimelech were brothers, and that Ahimelech succeeded Ahijah in the office of high priest. When David, warned by Jonathan, fled from Saul, Ahimelech, at Nob, fed him with the shew-bread, gave him the sword of Goliath, and assisted him to escape (I. Samuel xxi : 1-10). For this offense Saul put Ahimelech and his whole priestly household to death, only one man, Abiathar, escaping (I. Samuel xxii : 11-20).

AHITH′OPHEL (Heb., brother of folly, i.e., foolish). A native of Giloh in Judea; privy counselor of David, and probably grandfather of Bathsheba (II. Samuel xi : 3; xxiii 34). He was trusted implicitly by David, as well as by Absalom, whose revolt he joined (II. Samuel xvi : 23; xv : 12). Hushai, "David's friend," also counseled Absalom, but with a view to helping David (II. Samuel xvi : 16; xvii : 16), and his counsel of delay prevailed over Ahithophel's plan of quick action (II. Samuel xvii : 1-14). Hereupon Ahithophel, in despair, went home, put his household in order and hanged himself (II. Samuel xvii : 23).

AHLEFELDT, ä′le-fĕlt, ELISA DAVIDIA MARGARETHA, COUNTESS (1790-1855). A German woman noted for her patriotism and her love of letters. She was born in Denmark, and in 1810 became the wife of Major von Lützow, a German officer, whom she accompanied on his campaigns. She distinguished herself by her care of the wounded on the battlefield. In 1824 she separated from her husband, and lived for a time with the author Immermann.

AHLFELD, äl′fĕlt, JOHANN FRIEDRICH (1810-1884). A Lutheran pulpit orator. He was born at Mehringen, Anhalt; studied at the University of Halle (1830-33); taught and preached in various places till in 1847 he became pastor in Halle, whence in 1851 he went to the Nicolaikirche in Leipzig. There, till his resignation in 1881, he wielded a great spiritual influence as a leading evangelical. He died in Leipzig. He published several volumes of sermons. Consult his *Life* (Halle, 1885).

AHLGREN, äl′grĕn, ERNST, pen name of VICTORIA MARIA BENEDICTSSON, *née* BRUZELIUS (1850-1888). A Swedish author. She was born at Domme, near Trelleborg (Scania), and in 1871 married Christian Benedictsson, postmaster of Hörby. In consequence of illness and of great worry, she committed suicide at Copenhagen, whither she had gone in 1888. Her collection of novels, entitled *Från Skåne* (Stockholm, 1884), and the satirical narrative *Penningar* (*Money*, Stockholm, 1885; second edition, 1889) soon made her name known favorably throughout Sweden, where she was afterward regarded as the most distinguished among the younger woman writers. Her works are characterized by marked simplicity of style and a powerful and artistic description of life. Among them may be mentioned *Fru Marianne* (Stockholm, 1887; second edition, 1890); *Folklif och Smd Berättelser* (Stockholm, 1888); *Berättelser och Utkast* (Stockholm, 1888); *Romeos Julia*, a drama (1888); *Final*, a drama (in collaboration with A. Lundgård, Stockholm, 1885).

AHLQUIST, äl′kvĭst, AUGUST ENGELBERT (1826-89). A Finnish philologist and poet, professor of Finnish literature at Helsingfors. He was distinguished for ethnographic investigations, especially of the dialects and races of the Ural-Altaic family. In 1847 he started a Finnish journal. He translated some of Schiller's works into Finnish, and wrote poems. His more important original works are: *Wotish Grammar* (Helsingfors, 1885); *An Attempt at a Moksha-Mordwinian Grammar* (St. Petersburg, 1861); *The Structure of the Finnish Language* (1877).

AHLWARDT, äl′värt, HERMANN (1846—). A German politician and anti-Semitic agitator. He was born at Krien, Prussia, and about 1890 joined the anti-Semitic movement. He published a number of writings under the titles of *Der*

Verzweiflungskampf der Arischen Völker mit den Juden (1890); *Eid eines Juden* (1891); *Jüdische Taktik* (1892); and *Judenflinten* (1892), in which last-mentioned pamphlet he declared that Ludwig Löwe & Co. had furnished worthless guns to the army, and had been hired by the *Alliance Israélite* to cheat the German Government. These charges were declared by Chancellor von Caprivi to be false, but the popularity of the agitation steadily increased; and Ahlwardt was elected deputy to the Reichstag in 1892, and reëlected in 1893. He visited the United States in 1895, for the purpose of establishing an anti-Semitic propaganda here, but failed of his object.

AHLWARDT, Wilhelm (1828—). A German orientalist. He studied Oriental languages at Greifswald, his native city, and at Göttingen, and afterward devoted himself to an analytical investigation of the Arabic manuscripts in the libraries at Gotha and Paris. He became second librarian and professor of Oriental languages at the University of Greifswald in 1861. The following are a few of his more important works on Arabic philology and literature: *Ueber Poesie und Poetik der Araber* (Gotha, 1856); *The Divans of the Six Ancient Arabic Poets* (London, 1870). He also edited the following works by Arabic authors: *Elfachri Geschichte der islamischen Reiche. . . . von Ibn Ettigthaqa;* (Gotha, 1860); *Chalef Elahmar's Kasside* (Greifswald, 1859); *Diwan des Abu Nowas* (ib., 1861); and *Sammlungen alter arabischer Dichter* (3 vols., Berlin, 1902-03). He catalogued the Arabic MSS. in the Berlin Royal Library (in general catalogue, 10 volumes, Berlin, 1887-1900).

AHMADABAD, ä'mȧ-dȧ-bäd' (For derivation see Abad). The chief town in the district of the same name, in the presidency of Bombay, India, situated on the left bank of the Sabarmati, 290 miles north of Bombay, in lat. 23° N., long. 72° 36′ E. (Map: India, B 4). It was founded in the year 1412, on the site of the ancient Ashawal, by Ahmed or Ahmad Shah, and in 1818 came under British rule. It was famous for its manufacture of rich fabrics of silk and cotton, articles of gold, silver, steel, and enamel, industries still carried on, and to which may be added the manufacture of paper and superior pottery. It has recovered much of its extensive trade in indigo, cotton, and opium. It was formerly one of the largest and most magnificent capitals in the east, and its architectural relics are splendid, even in the midst of decay. The Jumna or Juma'ah Masjid, or great mosque, rises from the centre of the city, and is adorned by two superbly decorated minarets. Its domes are supported by lofty columns, regularly disposed, and the concave of these cupolas is ornamented with mosaic and fretwork. The pavement is of the finest marble. The mosque of Sujaat Khan and the modern Jain temple of Seth Hathi Sinh are extremely beautiful. There is likewise an ivory mosque, so named from the circumstance that, although built of white marble, it is lined with ivory, and inlaid with a profusion of gems, to imitate natural flowers, bordered by a silver foliage on mother-of-pearl. There are also the Fire Temple and the Tower of Silence of the Parsis. Ahmadabad once abounded in gardens, and there were aqueducts, reservoirs, etc. The city walls, built in the fifteenth century, which had become very dilapidated, were repaired in 1834, and a system of water-works was installed. Pop., 1891, 148,400; 1901, 185,889.

AHMADABAD. A district of Bombay (q.v.), British India (Map: India, B 4).

AHMED, äh'mĕd, or **ACHMET,** äk'mĕt, Vefik Pasha (1818-91). A Turkish statesman, born in Constantinople, and educated in Paris. His historical and statistical researches appeared in *Salaamé*, an annual of the Ottoman Empire begun in 1847. He was intrusted by the Porte with many important missions abroad, and was president of the council and minister of the interior at the conclusion of the Treaty of San Stefano (1878). He did much to acquaint his countrymen with French literature by his admirable translations of the plays of Molière and others.

AHMED KHAN, kän *or* kăn. See Mongol Dynasties.

AHMEDNAGAR, ä'mĕd-nŭg'ŭr, or **AHMEDNUGGUR** (Skr. *nagara*, city). A large town in the presidency of Bombay, India, situated 126 miles east of the city of Bombay, in lat. 19° 6′ N., long. 74° 46′ E., on a branch of the Great Indian Peninsular Railway (Map: India, B 5). It was once a splendid and populous city, and relics of its former magnificence are to be seen in many fine specimens of Moslem architecture. It is noted for its manufacture of carpets, silks, cottons, brass, and copper utensils. The city is surrounded by an earthen wall, and is guarded by a fort half a mile to the east. The houses are mostly built of sun-dried brick. It has a good water supply, conveyed by means of aqueducts. Founded in 1494 by Ahmed Nuzam Shah, it reached a high degree of prosperity during the reign of his son, Burhan, but after his death witnessed an incessant series of wars. It came under British rule in 1817, since when it has regained much of its former prosperity. Several places in India bear the same name. Pop., in 1901, 42,032.

AHMEDNAGAR. A district of Bombay, British India (Map: India, B 5).

AHMED SHAH, äh'mĕd shä (1724-73). Ameer of Afghanistan from 1747 to 1773. He was hereditary chief of the Abdali tribe, and held a command in Nadir Shah's cavalry until the latter's assassination (1747), when Ahmed went to Afghanistan, changed the name of his tribe to Durrani, and was accepted as their ruler by the Afghan chiefs at Kandahar. He was a warlike ruler, and accumulated great wealth, including the famous Kohinoor diamond. He captured Lahore in 1748 and conquered Kashmir; and in 1756 defeated the Great Mogul and took and sacked Delhi. His conquests introduced rebellion and disorder into the Mogul Empire. He defeated the Sikhs and Mahrattas at Panipat, January 6, 1761, but was finally obliged to yield the Punjab.

AHMES, ä'mĕs, or **AAHMESU,** ä'me-so͞o. An Egyptian scribe, who lived before 1700 b. c. He wrote *Directions for Obtaining the Knowledge of all Dark Things*. This work was not original with him. It was copied from an older treatise, dating from about 2500 b.c. It is important as one of the earliest satisfactory accounts of ancient Egyptian mathematics. It has been translated by Eisenlohr, *Ein mathematisches Handbuch der alten Aegypter* (Leipzig, 1877). See Algebra, and Arithmetic.

AHN, än, Johann Franz (1796-1865). A German grammarian and educationist. He was born at Aix-la-Chapelle, was for a time a merchant, but studied mathematics and modern languages, and was for many years a teacher in Neuss. He wrote many manuals for teaching languages, his method of instruction being an extension of that of Seidenstücker. His *Practical Method for a Rapid and Easy Acquisition of the French Language* (*Praktischer Lehrgang zur Schnellen und Leichten Erlernung der französischen Sprache*, 1834) has passed through more than two hundred editions and been extensively imitated.

AHNFELDT, än'fĕlt, Arvid Wolfgang Nathanael (1845-90). A Swedish littérateur, born at Lund. He studied art at Lund and Upsala, and was for some time an official in the royal library at Stockholm. In 1881 he was appointed editor of the journal *Ur Dagens Krönika.* He published a number of important monographs, such as those on *Almqvist* (1876), and *Crusenstolpe* (1880), a *Verldslitteraturens Historia* (1875-76), and other works.

AHOY' (*a* + *hoy*). A nautical form of hail. Its original signification is said to have been stop, and it still partakes of that meaning in a modified sense. It is used as a hail to passing boats, vessels, and implies that communication with them is desired. The common form of usage is "boat ahoy," "ship ahoy," "steamer ahoy," etc.

AHRENS, ä'rens, Heinrich (1808-74). A German writer on law, philosophy, and psychology. He studied at Göttingen, and was concerned in the political troubles in 1831, by reason of which he was forced to flee to Paris. In 1834 he became professor of philosophy at Brussels. He was a member of the Frankfort Parliament of 1848, and on the committee to draft a new German constitution. In 1850 he was chosen professor of legal and political science at Gratz, and in 1859 was called to a similar chair at Leipzig. For a number of years he represented the Leipzig University in the First Saxon Chamber. Among his works are: *Cours de Psychologie* (1837-38); *Cours de droit naturel* (1838); *Die juristische Encyklopädie* (1855-57). The two last named works have been republished in several languages.

AHRENS, Heinrich Ludolf (1809-81). A celebrated German philologist, born at Helmstedt. He studied at Göttingen, where he began his career as *privat-docent* in 1829, but left Göttingen in the following year to accept a position at Ilfeld, where he remained for fourteen years. In 1849 he was made director of the lyceum at Hanover, a position which he held until the year before his death. He devoted himself especially to the Greek dialects, and may be said to have laid the scientific foundation of their study. His chief publication was *De Græcæ Linguæ Dialectis* (1839-43). He published also, in 1855-59, a two-volume edition of the Greek bucolic poets, Theocritus, Bion, and Moschus.

AHRIMAN, ä'rĭ-mȧn. The ancient Persian devil, a personification of the evil spirit and principle of evil, the idea which answers in the Zoroastrian religion to Satan in Judaism and Christianity. He is represented as the head and chief of the powers of darkness and sin, and he has legions of demons about him. Next to him are ranged six arch-fiends, the chief of whom is Aēshma, the Daēva, or "demon of fury," corresponding, according to the majority of scholars, to the name Asmodeus (q.v.). Ahriman's name appears in the Avesta as *angra mainyu*, or *aisra mainyu*, Persian, *ahriman*—whence our spelling of the word. The term *mainyu* means spirit; the title *angra aisra* is uncertain, but it is presumed to signify injury, opposition, antagonism. Ahriman is the spirit of opposition, antithesis, and antagonism to the Persian god Ormuzd (q.v.). The two spirits severally represent the kingdom of light, goodness, and life, and the kingdom of darkness, evil, and death. The relation of the one spirit to the other, especially of Angra Mainyu, as the maleficent spirit, to Spenta Mainyu, or the beneficent spirit, has been frequently discussed. Consult: Darmesteter, *Ormuzd et Ahriman* (Paris, 1877), and Jackson, *Die iranische Religion* in Geiger and Kuhn's *Grundriss der iranischen Philologie,* vol. ii. (Strassburg, 1896-1904).

AHU, ä'hōō. The name in Persia of the common Asiatic gazelle. See Gazelle.

AHUATLE, ä'ōō-ät'l (Mexican). A preparation for food of the eggs of a Mexican species of ephydrid fly, which is formed into a paste mixed with hens' eggs and then fried. For further information, see Ephydra; Fly.

AHULL' (*a* + *hull*). A maritime term, used to denote the position of a ship when all her sails are furled and her helm lashed on the lee side; in such a position she lies nearly with her side to the wind, but with the head turned a little toward the direction of the wind.

AHUMADA, ä'ōō-mä'dȧ, Don Pedro Girón, Marques de las Amarillas, Duke of (1788-1842). A Spanish general and statesman, born at San Sebastian. He was appointed an officer in the Royal Guards in 1806, and during the war against the French rendered important services as chief of the general staff of the Spanish army. Upon the outbreak of the revolution of 1820 he was appointed minister of war, but soon retired because of the opposition of the Radicals. He was appointed by Ferdinand VII. a member of the council of regency during the minority of Isabella, and in 1835 accepted the portfolio of war under the premiership of Toreno. He soon resigned, and went to Bordeaux in 1836, but subsequently returned to Madrid.

AHURA MAZDA, ȧ-hōō'rȧ mäz'dȧ. See Ormazd.

AHWAZ, ȧ-wäz'. A small village, once a residence of the Persian rulers, situated on the River Karun, about 45 miles south of Shuster (Map: Persia, C 5). Near Ahwaz are the ruins of the old town, lying along the river for a distance of over ten miles. There is still to be seen an old castle of gigantic proportions, and a few other remnants of former splendor. In the third century, Ahwaz was the chief city of a province of the same name, and under the subsequent rule of the Arabs it became an important commercial centre. A concession to navigate the Karun from the Persian Gulf to Ahwaz was granted to a British company, which runs a steamer on the river, and is carrying out improvements on the road between Ahwaz and Ispahan. Pop., 1600.

AI, ä'ī (Heb. ruin). A city of the Canaanites, twelve miles north of Jerusalem. It is mentioned in the narrative about Abraham (Genesis xii : 8), where its situation is defined as east of Bethel. When the Israelites came into Canaan they made an unsuccessful attack on Ai (Joshua vii : 5), but on the second attack the city was taken (Joshua viii) and destroyed. Isaiah (Isaiah x : 28) mentions the city, so that it must have been rebuilt. After the captivity it was inhabited by the Benjaminites (Ezra ii : 28; Nehemiah vii : 32). The modern site is Khirbet Haiyân. Its ruins existed in the time of Eusebius and St. Jerome, though none are now to be found there.

AI, ä'ī. The three-toed sloth. See Sloth.

AI, ä'ē, or **AHYU**, ä'ū. A Japanese salmon (*Salmo altivelis*), remarkable for going down some rivers to spawn in the sea, and ascending other rivers annually to spawn near their sources.

AICARD, ȧ'kär', Jean François Victor (1848—). A French author, born at Toulon. He made his first appearance in literature with the drama *Jeunes croyances* (1867). His works, which are in general distinguished by a finished style, include *Au olair de la lune* (1870), a one-act comedy in verse; *Les rebellions et les apaisements* (1871), *Poèmes de Provence* (1874), *La chanson de l'enfant* (1876), *Miette et Noré* (1880), *Lamartine* (1883), which received the prize of the French Academy, *Jésus* (1896), a lyrical epic, *Tata* (1902), and *L'ame d'un enfant* (1903), idealistic tales, and a play, *Legende du cœur* (1903).

AID (Fr. *aide*, from Lat. *ad*, to + *iuvare*, to help). In feudal times, a term denoting a payment in money or produce due from a vassal to his lord. The term is a translation of the Latin word *auxilium*. In theory it was a free grant made in exceptional cases. But the cases soon came to be fixed by custom. "The three chief aids" were paid (1) for the lord's ransom when in captivity; (2) for the expenses of making the lord's eldest son a knight; (3) for the dowry of the lord's eldest daughter. Sometimes a fourth chief aid was recognized for the expense of the lord when going on a crusade. Frequently also aids were demanded from the vassals when the lord made a journey to the court of his suzerain, or to Rome. Aids were levied upon all classes of freehold tenants—upon those holding in free and common socage (q.v.), as well as upon the holders of knights' fees (q.v.)—and continued to be nominally due and exigible until abolished by parliament, 12 Car. II., c. 24 (1660), though they had gradually fallen into disuse and were probably even then practically obsolete. See Feudalism; Tenure.

AÏDA, ä-ē'dȧ. An opera by Verdi (words by Ghislanzoni), first played at Cairo, Egypt, December 24, 1871, at the inauguration of the Khedive's new theatre. The scene of it is laid in ancient Egypt.

AIDAN, ā'dan, Saint (?-651). First bishop of Lindisfarne. He was one of those distinguished monks of the early Scotch-Irish Church who were received into the calendar of saints without the ceremony of canonization. In early life he was a monk in Iona, the famous island off the Scotch coast. Oswald, the celebrated king of Northumbria, requested the community of Iona to send to his court one of their brethren who would teach the Christian religion to his people. The first person sent was a certain Cormac, who was too dogmatic and intolerant to be a successful missionary. On his return to report to the synod his failure, Aidan, who possessed the patience, geniality, and popular manners fitted for the task, was consecrated bishop (635) and sent forth. Through his success, he left a great reputation as the earliest promulgator of Christianity in the northern districts. He died at Bamborough, August 31, 651. For his biography consult Fryer, *Aidan, the Apostle of the North* (London, 1884).

AIDË, ä'ē'dā', Charles Hamilton (1830—). An English poet and novelist. He was born in Paris, the son of a Greek diplomatist. His mother was a daughter of Admiral Sir George Collier. He was educated at Bonn, served seven years in the British army, and then devoted himself to literature. Among his poems are *Eleanore* (1856), and *Songs Without Music* (1882). His novels include *Rita* (1859), *Passages in the Life of a Lady* (1887), and *Elizabeth's Pretenders* (1895). As a ballad writer he is known by *The Danube River* and *Remember or Forget*.

AID-DE-CAMP, ȧd'de-käN' (Fr., camp assistant), or **AID**. A military officer serving on the staff of a commanding general officer. In time of war it is a position of grave responsibility, as shown by the terrible mistake which led to the brilliant, but foolish, light cavalry charge of the British in the Crimean War of 1854. It is also a position involving much danger, as may be seen from the nature of the duties performed. On active service the aid-de-camp is in close confidential touch with the general officer to whom he is attached, and when necessary acts as his military secretary. On the battle-field he carries all orders from the general in command to the commanding officers of the various arms, and must of necessity be alert, quick-witted, resourceful, and prompt, giving his message in the plainest and most unmistakable form. Wherever possible such orders must be delivered in writing. In European nations, an appointment of aid-de-camp, particularly if on the staff of the ruler or a member of the ruling family, carries much social as well as military prestige, while in all services it is a much coveted and much sought appointment. In the United States a lieutenant-general is allowed to have two aids (lieutenant-colonels) and a military secretary; a major-general, three aids (either captains or lieutenants); and a brigadier-general, two aids (lieutenants). Before an officer can receive such appointment, he must have served at least two of the six preceding years with his regiment or corps. The appointment is for four years, and may not be exceeded, except on request of a general who retires within one year.

AIDENN, ā'den. A collateral form of Eden, Paradise, from the Arabic *Adn*, used by Poe in *The Raven*, on account of the rhyme.

AIDE-TOI ET LE CIEL T'AIDERA, ȧd'twä' ā le syȧl tȧ'd'-rȧ' (Fr. "Help thyself, Heaven will help thee"). The cry of certain French political writers to the middle classes about the year 1824. It became the watch-word and title of a society, having for its object to agitate the electoral body in opposition to the government. This, however, was to be done by means strictly legitimate, chiefly by correspondence and political publications. Most of its founders and active members belonged to the party of *Doctrinaires* (q.v.), as Guizot, who was president for some time, Duchâtel, Duvergier de Hauranne, Dubois, Rémusat, Thiers, Cavaignac, etc. *Le Globe* was the organ of the association, and afterward *Le National.* The society had a great share in bringing about the revolution of July, 1830, and was at first countenanced by the new government; but after a short time it was dissolved (1832).

AIDIN, ī-dēn′, or GUZEL-HISSAR. An important town in the Turkish Vilayet of Smyrna (21,583 square miles; population, 1,396,500), in Anatolia. It is on the river Meander, about 56 miles southeast of Smyrna, with which it is connected by rail (Map: Turkey in Asia, B 4). It is picturesquely situated near the ruins of ancient Tralles, and has well shaded streets, fine bazaars, and a number of mosques. It has an extensive trade in figs and cotton. Its population is about 36,000.

AID′-MA′JOR. An adjutant in the French army. See ADJUTANT.

AIGNER, ȧ′nyȧ′, JOSEPH MATTHÄUS (1818-86). An Austrian painter. He was born at Vienna and studied under Amerling. He took part in the revolution of 1848, but subsequently was pardoned. He was particularly known for his portraits, including those of Grillparzer, Feuchtersleben, Lenau, and Rubinstein.

AIGRET, ȧ′grĕt *or* ȧ-grĕt′, or AIGRETTE (Fr.). A small white heron or egret. (See EGRET.) Hence, a plume or erect ornament of feathers, originally the long filiform tuft of feathers that spring from the back of the egret in the breeding-season, and arranged to adorn the hair, a bonnet, headdress or helmet, or something similar to this, especially when jeweled. "A small bundle of these feathers has been used among Eastern nations as an ornament, and worn in the front of the turban, caftan, or other headdress by personages of high rank, being occasionally mounted with, or its form imitated by, precious stones; and the gift of an egret so bejeweled has been one of the most distinguished marks of honor that could be bestowed by an Oriental ruler upon a favorite minister or successful leader." The fashion has spread to Western nations and given rise to various decorations on military hats, and for women's hair and bonnets. The demand of millinery, indeed, during the last quarter of the nineteenth century, caused such inroads upon the breeding colonies of white herons in all parts of the world that these birds are everywhere greatly diminished in numbers, and in some regions, as in Florida, are almost exterminated. As the desired plumes grow only during the breeding season, the killing of a bird for their sake usually means the death of a family and the rapid depopulation of the colony. From this point of view, and remembering that great cruelty is likely to accompany the obtaining of the plumes, the statement of the annual sales of aigrets in London and other great markets is appalling to all persons of a humane mind and delicate taste.

AIGUEBELLE, ȧg′bĕl′, PAUL ALEXANDRE NEVEUE D' (1831-75). A French naval officer who entered the Chinese army. He distinguished himself against the Taipings in 1862-64, commanded the Franco-Chinese corps, and captured Hang-chow-fu, for which service he was made a mandarin of the first class. He established the arsenal at Fu-chow-fu and taught the Chinese to construct European vessels, the first Chinese man-of-war being launched under his supervision in 1869. In that year he was made Grand Admiral of the Chinese fleet.

AIGUES-MORTES, ȧg′mōrt′ (anciently Lat. *Aquæ Mortuæ*, Dead Springs). A small town in France (population, 1901, 4223), in the Department of Gard, which claims to have been founded by the Roman Marius (Map: France, L 8). It is situated in an extensive marsh impregnated with sea salt, and is about three miles from the Mediterranean, with which it is connected by a canal. It was from Aigues-Mortes that St. Louis sailed in 1248, and again in 1270, for the Crusades—a proof that the sea then reached this spot. In 1538 Francis I. had an interview at Aigues-Mortes with Charles V.

AIGUILLE, ȧ-gwēl′ (Fr., a needle). The name given to certain sharp mountain peaks in the Alps often covered with ice and snow, and so called from their resemblance to needles. Around Chamounix a number of the peaks bear this name. The term is also applied to an instrument used by engineers to pierce a rock for the reception of gunpowder in blasting.

AIGUILLETTE, ȧ′gwĭl-lĕt′ (from Fr. *aiguillette*, a point, pointed tag; dimin. of *aiguille*, needle). A detachable portion of a military dress uniform consisting of bullion cords and loops and worn on the right shoulder. In the United States Army the aiguillette is at present worn by officers of the general staff corps, except the chief of staff, by officers of the Military Secretary's department, the Inspector Generals of the department, the aides-de-camp to general officers, and regimental and artillery district adjutants. For these the aiguillette is made of gold-wire cord, according to a sealed pattern kept in the office of the Quartermaster-General.

AIGUILLON, ȧ′gwē′yôɴ′, ARMAND DE VIGNEROT DUPLESSIS RICHELIEU, DUC D' (1729-82). A French statesman, minister of foreign affairs under Louis XV. (1771-74). He became governor of Brittany in 1754. His despotic administration of his province finally brought upon him the condemnation of the Parliament of Rennes. But Madame du Barry, the mistress of Louis XV., not only saved him from punishment, but finally brought about his promotion as minister. He was entirely incompetent, and Louis XVI. replaced him by Vergennes.

AIJALON, ā′jȧ-lŏn. See AJALON.

AIKAWA, ī-kä′wȧ. A town of Japan, on the western coast of the island of Sado (Map: Japan, F 4). It is poorly built but important on account of the gold and silver mines situated close to it. Its population is (1898) 10,700.

AIKEN, ā′kĕn. A beautiful town and county seat of Aiken Co., South Carolina, on the South Carolina and Georgia railroads, 17 miles east of Augusta (Map: South Carolina, C 3). It has a fine location, at an elevation of 600 feet above sea-level, in an agricultural and pine forest region, and the dryness and comparative mildness of its climate have combined to make Aiken an important health resort as well as a popular pleasure resort for the wealthy. Aiken is the seat of Aiken Institute, for white students; the Schofield Normal and Industrial School and Immanuel Training School, for negroes. Aiken was first incorporated in 1835, and is governed under a charter of 1890, revised in 1897, which provides for a mayor, elected biennially, and a city council, composed of the mayor and six aldermen. The water supply and sewerage system are under municipal control. Pop., 1890, 2362; 1900, 3414.

AIKEN, William (1806-87). An American legislator. He was born in Charleston, S. C., and graduated at the College of South Carolina (1825). After serving in the State Legislature (1838-43), he was governor of South Carolina (1844-46), and was a Democratic representative in Congress from 1851 to 1857, during which time he lacked only one vote of becoming speaker of the House of Representatives. He opposed both nullification and secession, and after leaving Congress took no active part in politics, except in 1866, when he was again elected to Congress, but was not admitted to a seat.

AIKIN, John, M.D. (1747-1822). An English physician and author. He had only moderate success as a physician, but gained considerable reputation as a scholarly writer. With his sister, Mrs. Barbauld, he published *Evenings at Home* (six volumes, 1792-95), together with a number of biographical works, including *General Biography* (ten volumes, 1799-1815). He edited the *Monthly Magazine* (1796-1807), and *Dodsley's Annual Register* (1811-1815).

AIKIN, Lucy (1781-1864). An English writer, daughter of John Aikin, and his assistant in much of his work. She wrote one novel, *Lorimer* (1814), but her reputation rests on her series of court memoirs, beginning with *Memoirs of the Court of Elizabeth* (1818), and on her *Life of Addison* (1843). She also wrote memoirs of her father and of her aunt, Mrs. Barbauld.

AIKMAN, āk′man, William (1682-1731). A Scottish portrait painter. He studied in Edinburgh and Rome, traveled in Italy and Turkey, and practiced his art first in Edinburgh and afterward in London. He painted portraits of Allan Ramsay, Gay, Thomson, and John, Duke of Argyll.

AILANTHUS, ȧ-lăn′thŭs, or **AILANTO** (Malacca name, tree of heaven). A lofty, spreading tree (*Ailanthus glandulosus*), of the natural order Simarubaceæ, a native of China, but now frequently planted to shade public walks in the south of Europe, in England, and in North America. The flowers of the male plant have a disgusting odor. The leaves resemble those of the ash. The tree flourishes on light soils, and is hardy enough to endure even the climate of the north of Scotland. It has been somewhat extensively planted in the United States. The tree is easily propagated by suckers and cuttings of the roots. The wood is fine-grained, satiny, and suitable for cabinet making. Ailanthus imberbiflora and Ailanthus punctata are among the important timber trees of Australia. Another species, Ailanthus excelsus, is common in India. The genus Ailanthus has been recognized by fossil fruits and leaves in Tertiary beds of Europe and North America.

AILANTHUS MOTH. A large, hardy, silk-spinning moth (*Philosamia cynthia*), introduced from China into the United States on the ailanthus tree. The caterpillar may be identified by its rows of tufts of white hairs.

AILETTE, ȧ-lĕt′ (Fr. little wing). An appendage to the armor worn by knights on each shoulder. Ailettes were of various forms and sizes, and bore the heraldic device of the knight. They were not intended primarily for defense, as is evident from the fact that most of them stood up straight in the air, but in some cases they seem to have been adapted as a defense for the shoulders. They were in use between 1280 and 1330. Epaulets are said to have been derived from these.

AILLY, ȧ′yē′, Pierre d', or Petrus de Alliaco (1350-1420). A French theologian. He studied theology in Paris, where, in 1380, he became a doctor of the Sorbonne. He was leader of the Nominalists, asserted that the Church rests on Christ, not on Peter, and derives its authoritative teachings from the Scriptures, not from canon law. He became grand master of the College of Navarre, Paris, in 1384, and in 1389 confessor and almoner to Charles VI., and the same year Chancellor of the University of Paris. His defense, two years previous, of the Immaculate Conception, won him the epithets "Eagle of France" and "Hammer of Heretics." He became Bishop of Le Puy, 1395, and of Cambrai in 1397. He induced the calling of the Council of Pisa, of which he was an active member. He was made cardinal by John XXIII. (1411), and was sent as legate to Germany in 1413. He was prominent in the Council of Constance, 1414-18, furthering the condemnation of Huss and Jerome of Prague, but strenuously advocating reform in the Church; maintaining the authority of councils over that of popes, and aiding in the election of Martin V. in place of three rival popes. He was afterward made papal legate at Avignon until his death. His writings are numerous. Among them is an attempt to harmonize astronomy and theology. For his biography, consult: P. Tschackert (Gotha, 1877), and L. Salembier (Lille, 1886).

AILRED, āl′rĕd, Saint, Æthelred, Ethelred (1109-66). An English ecclesiastic and historian, born at Hexham, Northumberland. He was educated at the Scotch court, became a Cistercian monk in Rievaulx Abbey, Yorkshire, then abbot of Revesby, 1142, then of Rievaulx, 1146, remaining so till his death, January 12, 1166. He was canonized in 1191. He was the author of many historical and theological works, the former of little value, owing to their unlimited credulity. Leland says he saw Ailred's tomb at Rievaulx adorned with gold and silver ornaments. His works are in Migne, *Patrol. Lat.*, cxcv.

AILSA CRAIG, āl′sȧ krāg. A small island off the western coast of Ayrshire, Scotland (Map: Scotland, C 4). It is only two miles in circumference and rises to a height of 1114 feet above the sea. It terminates in high cliffs on the northwest, and contains some springs near its summit. It is well known for its columnar form, and has a lighthouse, erected in 1836.

AIMAK, ī-mäk′. A term of Mongolian origin signifying "clans," and, with the prefix *char* ("four"), employed as a designation for a number of tribes inhabiting the central and northwestern part of Afghanistan. Little is known concerning them except that they are a Mongolian people dwelling in the midst of an Aryan population, and speaking a dialect that seems closely related to the Calmuck, though largely influenced by the Persian. According to some authorities the four principal tribes of the Aimak are the Jamjidi, the Firozkohi, the Taimuni, and the Hazaras; others make a definite distinction between the Aimak and the Hazaras, characterizing the former as Sunnite Mohammedans and the latter as adherents in the main of the Shiite sect. Macgregor, *Central Asia* (Calcutta, 1871), substitutes the Saidnat for the Hazaras, and estimates the total number of the Aimak at 250,000, describing them as semi-nomadic in their habits and excellent fighters. They are supposed to be descendants of Turkish-Tartar tribes which under Hulaku Kahn overthrew the Persian Caliphate in the middle of the thirteenth century.

AIMARA, ī-mä'rȧ. Any of many large carnivorous fishes of South America, especially common in the Amazonian rivers, some twenty species of which form the heterognathous family Erythrinidæ and the genus Macrodon. They are also called trahiras.

AIMARD, ā'mär', GUSTAVE (1818-83). A French novelist. He shipped to America as a cabin-boy, spent ten years among the Indians of the western prairies, and traveled in Spain, Turkey, and the Caucasus. In 1848 he was in Paris, and an officer of the Garde Mobile. At the time of the Franco-German war, he organized, and for a while commanded, the so-called "francs-tireurs of the press." He is sometimes called the French Fenimore Cooper. He published many adventure stories, for the most part improbable but interesting. The list, many volumes of which have been translated into English, includes: *Les trappeurs de l'Arkansas* (1858); *Le grand chef des Ancas* (1858); *Les pirates de la prairie* (1859), and *Les scalpeurs blancs* (1873).

AIMÉ-MARTIN, ȧ'mȧ'mär'tăɴ', LOUIS. See MARTIN, LOUIS AIMÉ.

AI'MON. See AYMON.

AIM'WELL. (1) A character in Farquhar's comedy, *The Beaux' Stratagem* (q.v.). (2) A character in Shirley's *The Witty Fair One* (q.v.).

AIN, ăɴ. A river in France, which rises in the Jura Mountains. It flows through the departments of Jura and Ain, and after a course of about 120 miles falls into the Rhone, 18 miles above Lyons (Map: France, M 5). It is used for floating timber, and admits of navigation down stream only.

AIN. A frontier department of France, separated from Switzerland and Savoy by the Rhone (Map: France, M 5). Capital, Bourg.

AINGER, ān'jẽr, ALFRED (1837-1904). An English clergyman and writer. He was born in London, and was educated at King's College and at Trinity Hall, Cambridge. He was ordained priest in 1863, and three years afterward was appointed reader of the Temple Church, a position which he held until 1894, when he succeeded Dean Vaughan as Master of the Temple. He is a canon of Bristol and chaplain-in-ordinary to the king. As an author, he is best known for his editions of *Lamb's Collected Works* and for his *Biography of Charles Lamb* ("English Men of Letters Series").

AINMILLER, īn'mĭl-lẽr, MAX EMANUEL (1807-70). A German designer of stained glasses and the principal reviver of this art in the 19th century. He was born at Munich, Feb. 14, 1807, and at first studied the architecture in the Munich Academy under Gärtner, and was then appointed designer in the Royal Manufactory of Porcelain at Nymphenburg. When the Royal Manufactory of Stained Glasses was organized at Munich, he was made inspector of the Institution and afterwards became its head. By his technical improvements he revived the ancient art of stained glasses, achieving a variety of color not hitherto attained. He was also the first to design stained glasses on panels, thereby founding an interesting variety of this art. His principal works include the windows of the Cathedrals of Regensburg, Cologne, and Speyer, and of the Aukirche in Munich; also the University Church at Cambridge, St. Paul's Cathedral, London, and the Cathedral of Glasgow—the last being the most extensive of his works. In the two last-named designs he was assisted by his son Heinrich (1837-92), who was also a designer of note. As an architectural painter, the elder Ainmiller executed a number of pictures of mediæval church interiors, of which there are good examples in the Pinakothek at Munich and the National Gallery at Berlin. Although these paintings display minute architectural knowledge, they are hard and cold in color.

AINO, ī'nô, *or* **AINU**, ī'noo͞ (men of Aiona, their reputed ancestor, or possibly a corruption of *inu*, dog, contemptuously applied to them by the Japanese). An aboriginal people, now numbering some 18,000 souls, in northern and eastern Yezo, the southern part of Saghalien, and the southern Kuriles (all but 1500 live on Yezo). They inhabited once a great part, if not all, of the Japanese Archipelago, and were the first race to dwell there, unless the so-called "pit-dwellers" of Yezo and Saghalien were, as Hitchcock (1890) suggested, driven out by them when they intruded into this area from their former home on the adjoining Asiatic coast many centuries B.C., as the archæological remains (shell heaps, stone implements, pottery, etc.) in Japan indicate. The retreat northward of the Aino is noted in Japanese chronicles referring to the "barbarians." The physical characteristics of the Aino—short stature, flattened humerus and tibia, heavy beards, and general hirsuteness (much exaggerated by travelers), lighter skin, dolichocephaly and brachycephaly, somewhat regular features, and non-savage looks—have given rise to theories of relationship with almost every known race. Brinton (1890) allies them with the Giliaks of the Amur; Deniker (1900) considers them *sui generis;* Keane (1896) and Baelz (1901) believe them to have been originally of the Caucasian (white) race. The last, who has studied the Aino at first hand, is of the opinion that they are the extreme eastern branch of a race related to the Caucasian stock, once occupying much of Northeastern Asia, but split into two sections by the inroads of the Mongol-Turkish peoples at a very remote date, a view which has a good deal to commend it. But the Aino are not a uniformly pure type, as the differences between those of Yezo and of Saghalien show. The linguistic, geographical, and mythological researches of B. H. Chamberlain (1887) and Bachelor (1882-1894) prove both the uniqueness of the Aino tongue and the great influence upon Japanese life exerted by that people in times past. Driven northward from their ancient habitat in southwestern and central Japan, they have left their names on the natural features of the archipelago. Their language is simple and harmonious and resembles the Japanese in structure, but is quite distinct in vocabulary. It has been reduced to writing only recently. The Rev. John Bachelor has compiled an Aino grammar and dictionary, and translated the New Testament into the tongue. The Aino religion, originally a rather primitive nature-worship, with the cult of the bear especially prominent, and their folk-tales, have evidently received some additions from Japanese sources in historical times. In the last few years some of the Tsuishikari Aino have become Buddhists of the Monto sect, and a few others in the region of Piratori have become Protestants. A good account of the Aino (with bibliography) was published by Professor Hitchcock in the *Report of the United States National Museum* for 1890. An important discussion of them is to be found in the anthropological studies of Koganei (1893-94), and Landor's *Alone with the Hairy Ainu* (1893). Baelz, in the *Verhandlungen der Berliner Gesellschaft für Anthropologie* for 1901, considers that the amount of Aino blood in the Japanese outside of Yezo has been much underestimated. He notes also the increasing intermixture of Japanese and Aino, and foresees the ultimate disappearance of the latter, not by extinction, but by natural amalgamation with the former. This amalgamation is favored by the gradual abandonment of ideas about their alleged mental inferiority. (See Japan, paragraph *Ethnology.*) In addition to the works cited in the text, consult: Griffis, *The Mikado's Empire* (New York, 1876); Bird, *Unbeaten Tracks in Japan* (London, 1885); Chamberlain and Bachelor, *Aino Studies* (Tokio, 1887); *Transactions of the Asiatic Society of Japan* (Yokohama, 1874-98); Batchelor, *The Ainu and their Folk-lore* (London, 1901).

AINSLIE, ānz'lĭ, Hew (1792-1878). A Scottish-American poet, born at Bargeny Mains, Ayrshire. While a clerk in the register house at Edinburgh he acted as amanuensis to Professor Dugald Stewart. He emigrated to the United States in 1822, and joined for a year Robert Owen's venture at New Harmony, Ind. (See Harmonists.) He subsequently went into business. His numerous dialect poems had extended his reputation to Scotland, where he was enthusiastically received by literary folk in 1864. These poems, many of which were highly esteemed by Sir Walter Scott, were collected and edited by a friend, W. Wilson (1855). Some of them are also to be found in Wilson's *Poets and Poetry of Scotland* (1876).

AINSWORTH, ānz'wûrth, Frederick Crayton (1852—). An American soldier, born at Woodstock, Vt. He was appointed assistant surgeon, United States Army, in 1874, and in 1891 major and surgeon. In 1892 he was promoted to be colonel and chief of the Record and Pension Office, and in that capacity introduced the index record-card system, by means of which the history of every soldier is made readily available. He was made a major-general in 1904, and was appointed military secretary of the Military Secretary's Department.

AINSWORTH, Henry (1571-1623). An English scholar and divine. He was driven from England by proscription in 1593 because he was a Brownist, and lived in poverty in Amsterdam until, in 1596, he became teacher in the church there of the Brownists. Though never forward, he was the most steadfast, resolute, and cultured champion of the principles of civil and religious freedom represented by the nonconformists in Great Britain and America. While fighting for freedom from hierarchical tyranny, Ainsworth pursued his Hebrew studies, and for a long time biographers had two Henry Ainsworths, one the learned rabbinical student, the other the arch-heretic and leader of the Separatists; but the two were one man. His most notable work is *A Defense of the Holy Scriptures, Worship and Ministry used in the Christian Churches separated from Anti-Christ, against the challenges, cavils, and contradictions of M. Smythe in his book entitled "The Differences of the Churches of the Separation"* (Amsterdam, 1609). He wrote notes on all the books of the Pentateuch, the Psalms, and Solomon's Song. There is a story, not probable, that he was poisoned by Jews.

AINSWORTH, Robert (1660-1743). An English lexicographer, author of a Latin dictionary which was once extensively used. He was born near Manchester and taught school in London. He began his dictionary in 1714; it was first published in 1736.

AINSWORTH, William Francis (1807-96). An English physician, geologist, and traveler. He was born in Exeter, and graduated in medicine at Edinburgh in 1827. He then traveled in France, and prosecuted geological investigations in the Auvergne and Pyrenean mountains. On his return in 1828 he conducted the *Journal of Natural and Geographical Science*, and delivered lectures on geology. In 1835 he was attached as physician and geologist to the Euphrates expedition under Colonel Chesney, and returned home in 1837 through Kurdistan, the Taurus, and Asia Minor, visiting the latter again the following year. He published *Researches in Assyria* (1838). He also published *The Claims of the Christian Aborigines in the East* (1843) and *Travels in the Track of the Ten Thousand Greeks* (1844). He was a member of many learned societies and was widely known in many branches of research.

AINSWORTH, William Harrison (1805-82). An English novelist, born at Manchester. His creative fancy began early to show itself in ballads and tales, which appeared in the local newspapers and in contributions to the *London Magazine* and other periodicals. He first studied law, but tiring of that, he began a publishing business in London, and that did not succeed. His first novel was *Sir John Chiverton* (1826); his second, *Rookwood* (1834), was very favorably received. *Crichton* (1837) and *Jack Sheppard* (1839) followed soon after. He edited *Bentley's Miscellany* for a time; in 1842 began his own *Ainsworth's Magazine*, and from 1853 edited the *New Monthly Magazine*. Some of his other works are: *Lancashire Witches* (1848); *Star Chamber* (1854); *Cardinal Pole* (1863); *John Law, the Projector* (1864); *The Spanish Match* (1865); *Merrie England* (1874); and *Beau Nash* (1880). All his works, and particularly his earlier ones, were remarkably popular in England. Their publication began when the inane "fashionable novel" was the staple, and they presented an agreeable contrast. The historical element, together with the scenery of his native country, is prominent in most of them. Analysis of character or motives had no place in his works; his strength was in the vividness and directness with which he realized scenes and incidents.

AINTAB, īn-täb′. A town in the Syrian vilayet of Aleppo, Asiatic Turkey, situated about 65 miles north of the city of Aleppo (Map: Turkey in Asia, G 4). It is an important military post and is well fortified. It carries on an extensive trade in leather and cotton, and lies on the route leading from Aleppo to Armenia. Its population is about 43,000, and consists, to a great extent, of Armenian and Greek Christians.

AIR, ä-ēr′, or ASBEN. A mountainous region in the southern part of Sahara, situated between 17° and 20° northern latitude and 7° and 10° eastern longitude. It is the most considerable centre of population in the entire Sahara. The palm, fig, and mimosa yield abundant fruit; the camel and zebra are raised on the pastures. There are no permanent rivers, but the numerous ravines fill with water during the rainy season and overflow the valleys. The country is ruled by a native Sultan, and the population, estimated at about 100,000, consists chiefly of Tuaregs. The capital is Agades (q.v.), but Tintellust, (60,000 inhabitants), is the chief centre of population.

AIR (Lat. *aër*, Gk. ἀήρ, *aēr*, from ἄειν, *aein*, to blow). The mixture of gases forming the atmosphere of the earth. It consists essentially of 79.03 parts of nitrogen and 20.97 parts of oxygen, with varying small quantities of carbonic acid, ammonia, ozone, argon, helium, neon, krypton, and xenon (qq.v.), aqueous vapor. Certain chemical compounds, as common salt, ammonium nitrate, etc., as well as minute particles of animal, vegetable, and mineral matter, are also frequently found in the air. Early chemists called all gases airs. The chief properties of air and the phenomena they give rise to may be found treated under ATMOSPHERE; AËRODYNAMICS; AËROSTATICS; BAROMETER; AËRONAUTICS, etc.

AIR BLAD′DER OF FISH′ES. See FISH.

AIR BRAKE. A brake worked by compressed air, which is extensively applied to railway cars in the United States, and also to a less extent in other countries. Air brakes are also used on street railway cars. The air brake in its first form was invented by George Westinghouse, Jr., an American engineer, in 1869, and is known as the straight air brake. This brake consisted of an air pump, a main reservoir, and an engineer's valve on the locomotive, and of a train pipe and brake cylinder on each car. The air pump served to keep the main reservoir filled with air under pressure, and the brakes were applied by throwing the engineer's valve so as to allow the air from the main reservoir to enter the train pipe and thence into the brake cylinders on the cars, thus forcing the pistons out and applying the brakes on each car. The train pipe of one car was connected to that of the next by flexible hose, with a coupling between cars. This form of brake had several objections, the more important of which were that the brakes on the forward cars were applied so much sooner than those on the rear cars that the rear cars bunted up against the forward cars, causing shocks and damage; and in case a hose burst or a coupling parted, the air pressure would escape without setting the brakes. These objections to the straight air brake led Mr. Westinghouse to invent, in 1873, the automatic air brake. In this brake each car was equipped with an auxiliary reservoir and a triple valve in addition to the train pipe and brake cylinder. The triple valve was located at the junction of the train pipe and the two pipes leading to the brake cylinder and to the auxiliary reservoir. The principle of operation of this improved brake is as follows: Air pressure is maintained in the auxiliary reservoirs and in the train pipe at all times when the brakes are not applied, the pressure in the train pipe being exactly equal to that in the reservoirs, and there being no pressure in the brake cylinder, owing to the fact that as long as the train pipe and auxiliary reservoir pressures are equal, the triple valve is held in a position closing the air inlet to the brake cylinder. To apply the brakes, the equilibrium between the train pipe and the auxiliary reservoir pressures is disturbed by allowing air to escape from the train pipe; as soon as this is done, the excess air pressure in the auxiliary reservoir throws the triple valve so that it admits pressure from the reservoir into the brake cylinder and applies the brakes. To release the brakes, air pressure is retained in the train pipes by admitting air to it from the main reservoir on the locomotive. This gives an excess pressure in the train pipe above the pressure in the auxiliary reservoir, which throws the triple valve so as to close the inlet to the brake cylinder and open the inlet to the auxiliary reservoir from the train pipe, thus allowing the two to attain equal pressures again. To permit air to escape from the train pipe, and thus apply the brakes, there is the engineer's valve previously mentioned, and also a conductor's valve on each car, the latter being used only in case of emergency. It is evident also that should a break occur in the train pipe, or its hose connections, through any accident, the pressure is relieved and the brakes are applied automatically.

It will readily be appreciated from what has been said that the triple valve is an exceedingly important part of the mechanism of the automatic air brake. It performs three duties: (1) Charges the auxiliary reservoirs; (2) applies the brakes; and (3) releases the brakes. These duties are, moreover, performed automatically, and, as experience has shown, with almost absolute certainty as long as the valve mechanism is kept in good order. The triple valve is, however, not the only automatic feature of the air brake. The operation of the air pump is controlled automatically by a pump governor, which shuts the steam off from the air pump as soon as the pressure in the main reservoir has reached a certain amount, and admits it again when the pressure falls below this amount. There is also an automatic contrivance for closing the ends of the coupling hose when they are disconnected; this valve opens automatically when the hose is coupled. This describes briefly the construction and operation of the plain automatic air brake. It was, as will be obvious to all, a vast improvement over the straight air brake. Its chief objection was that in an emergency application on a long train the forward brakes were applied so much sooner than those in the rear that the slack of the train ran ahead and often did great damage. To remedy this objection Mr. Westinghouse invented, in 1887, the quick action triple valve, by which the application was so much hastened at the rear of the train that the slack had no chance to run ahead. At present the quick action brake is the prevailing equipment of railway trains in America, it having replaced practically entirely the plain automatic brake. The very high passenger train speeds of recent years led Mr. Westinghouse, in 1897, to place on the market a high speed brake. This brake is designed to use very high air pressure when the brake is applied with the train at full speed, which pressure is gradually reduced by an automatic reducing valve on the brake cylinder as the speed diminishes. This brake has not been extensively used. Tests made with the regular high speed brake attached to a fifty-car train showed the following among other results: Emergency stop of train running at 40 miles per hour made in about 675 feet, in 20 seconds; breaking the train in two at a speed of from 20 to 25 miles per hour, the two sections stopped at distances of from 32 feet to 180 feet apart; applying brakes with train standing to show rapidity of action, all brakes applied within two seconds; comparison of emergency air brake stop and hand brake stop at 20 miles per hour; air brake stop in 158 to 194 feet, hand brake stop in 1000 feet to 1720 feet; service stop test to determine time of release of brakes, all brakes released in four seconds. Several forms of air brake besides the Westinghouse have been employed to some extent in America, but they are exactly similar in their principles of operation. The air brake has been applied to electric street cars and to cable cars. Here the air pump is operated from one of the axles, and usually the straight air system is used, in the form previously used for steam railway trains. For further and more technical information on this subject, see Blackall, *Air Brake Catechism* (New York, 1903); Synnestvedt, *Air Brake Diseases* (New York, 1900); *Proceedings Master Car Builders' Association.* See also Dukesmith, ***Modern** Air Brake Practice* (Chicago, 1904).

AIR CELLS, or **AIR SACS.** See BIRD.

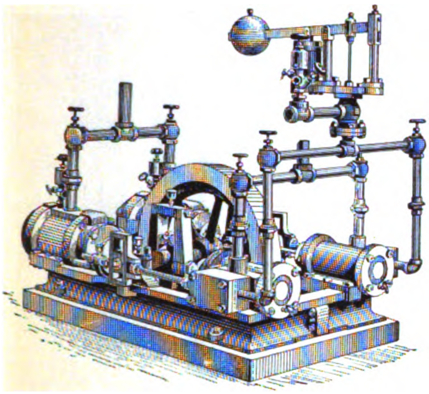
AIR COMPRES'SOR, or **AIR PUMP.** A machine for compressing air. Compressed air is used for a multitude of purposes in the arts and in manufacturing, and to catalogue all of its uses would require a great amount of space. The simplest form of air pump is the little apparatus for inflating bicycle tires, with which nearly every one is familiar. These bicycle pumps are made both single and double acting, the single acting pump being the simplest form of air compressor. Compared with the enormous air compressing machines used in shops and mines, this little device seems almost too trivial to merit notice, but by carefully observing its actions and their effects we have brought to our attention several phenomena which are important facts in air compressing on a large scale. One of these phenomena is the power required to pump against the resistance of the compressed air in the nearly inflated tire; the second and more important is the fact that a very perceptible development of heat results as the pumping proceeds. The bearing of both these observations will appear as we proceed. For the present it need only be observed that hand air pumps of the simple form indicated are used for a variety of purposes where only a small amount of compressed air is required. Where a somewhat larger volume of air is required, hand pumps provided with fly-wheels and operated by one or more men by means of a crank, are employed. With these large hand pumps we arrive at power air compressors.

The air pump was invented by Otto von Guericke of Magdeburg, Germany, about 1654. In 1753 Holl used an air engine for raising water, and in 1788 Smeaton invented a pump for use with diving apparatus. In 1851 compressed air was used by William Cubitt for bridge work, and a little later it was used by Brunel for the same purpose. In 1852 Colladon patented the application of compressed air for driving machine drills in tunnel construction. Sommeiller developed Colladon's idea, and constructed an air compressing plant for the Mont Cenis Tunnel work. (See TUNNELS.) The Sommeiller compressor was operated as a ram, utilizing a natural head of water to force air at 80 pounds pressure into a receiver. The column of water contained in a long pipe on the side of the hill was started and stopped automatically by valves controlled by engines. The weight and momentum of the water forced a volume of air with such a shock against a discharge valve that it was opened, and the air was discharged into the tank. The valve was then closed and the water checked, and a portion of it was allowed to discharge and the space to fill with air, which was in turn forced into the tank. The injection of water in the form of a spray into the compressor cylinder was first introduced on the St. Gothard Tunnel work begun in 1872. The first compressor used in America was developed by Mr. Thomas Doane, the chief engineer of the Hoosac Tunnel, and was employed on that work. This compressor had four single acting cylinders, and was cooled by the injection of water through the inlet valves into the cylinders. These early compressors are of historical interest only at the present time. As the necessity for compressed air power grew, inventors turned their attention to the design and construction of compressors which would combine efficiency with light weight and economy of space and cost. As the result of this work, the modern air compressor has been developed.

The simplest form of power air compressor is the air brake pump, with which practically every American locomotive is equipped. In this pump, it will be readily understood, the main considerations are economy of space, light weight, and absolute reliability of action; economy of steam consumption being quite a secondary matter. A 9½ inch air brake pump, for example, will give 1.85 cubic feet of air at 90 pounds pressure, with a consumption of 1 pound of steam at 140 pounds pressure, while a two-stage Corliss air compressor will give 13.7 cubic feet of air at 90 pounds pressure with the same steam consumption. The standard air brake has a steam cylinder and an air cylinder of the same size, viz., 9½ inches diameter and 10 inch stroke, set vertically one above the other, with a common piston rod. See AIR BRAKE.

It has been stated above, in referring to the bicycle pump, that air is heated by compression. As heat causes air to expand, a cubic foot of hot air, at, say, 75 pounds pressure, will decrease in volume when cooled, and thus bring about a reduction in pressure to something less than 75 pounds. Evidently, therefore, a loss of work done in compression results from the heating of the air. The amount of the loss is estimated at 21.3 per cent. of the total work done in compressing air to 75 pounds pressure. To save this loss,

AIR COMPRESSORS



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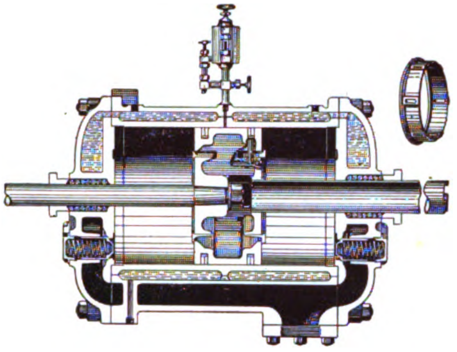

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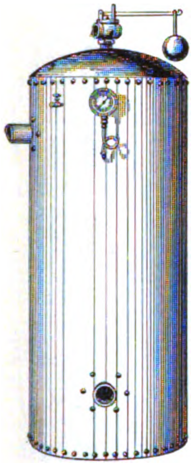

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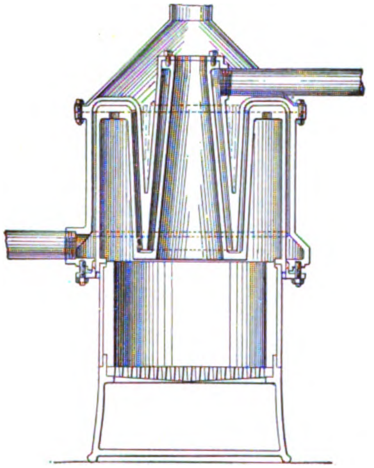

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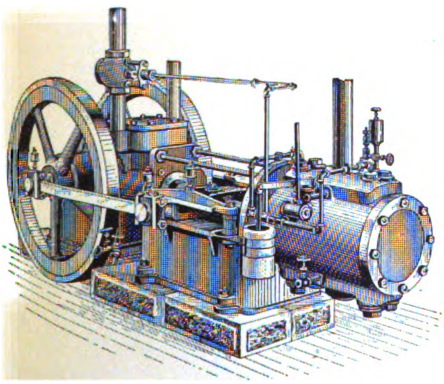

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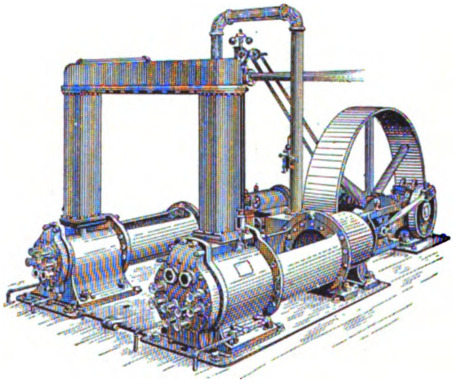

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1. CLAYTON DUPLEX COMPRESSOR.
2. PISTON INLET AIR CYLINDER for Ingersoll-Sergeant Compressor, showing water-jacket and valves.
3. SHEET STEEL AIR RECEIVER.
4. SECTIONAL VIEW OF RAND RE-HEATER.
5. INGERSOLL-SERGEANT COMPRESSOR.
6. RAND COMPOUND COMPRESSOR.

compressors are designed with some form of device for keeping the air cool during compression. Two systems are used, by which it is attempted to keep the air cool during compression, and these systems divide air compressors into two classes, as follows: (1) Wet compressors which introduce water directly into the cylinder during compression, (a) in the form of a spray, and (b) by the use of a water piston; (2) Dry compressors, which admit no water directly into the cylinder, but have the cylinder surrounded by a jacket, into the space between which and the cylinder walls water is forced and kept in circulation. The water piston compressor is now seldom used. Cooling by the water spray injection gives the most efficient results as far as cooling the air is concerned, but it has so many objections that it has been found to be the best practice to use the less efficient but vastly more simple water-jacket system, and endure the loss of heat which might be saved by using water spray injection. Accordingly, we find that most air compressors are nowadays provided with a water-jacketed air cylinder for cooling the air during compression. Vertical air compressors have the steam cylinders placed vertically above the air cylinders; horizontal compressors have the steam and air cylinders placed horizontally one ahead of the other. Direct air compressors have the steam and air piston on the same piston rod, so that the thrust of the steam piston gives a direct thrust on the air piston; indirect acting compressors transfer the thrust of the steam piston by means of cranks and gearing to the air piston rod. A simple acting compressor is one which compresses air on the forward stroke of the air piston only, the back stroke doing no useful work; a double acting compressor compresses air on both the forward and back strokes of the air piston. A two-stage compressor partly compresses the air in one cylinder, from which it is passed to a second cylinder, where it is further compressed. Generally, the air in passing from the first to the second cylinder passes through an inter-cooler, where it is cooled by water. Three-stage and four-stage compressors are sometimes employed. A duplex air compressor consists of a right-hand steam and air cylinder and a left-hand steam and air cylinder, each side being capable of being run separately, or the two sides can be run together. A duplex compressor may have either the air cylinders or the steam cylinders, or both air and steam cylinders compounded. Air compressors may have the steam cylinders replaced by a pulley, so that they may be operated by a belt, or by a water wheel obtaining power from a head of water.

Whatever the form of compressor which is used, the mechanical action in compressing the air is that of a piston working in a cylinder, exactly as in the case of a bicycle pump. As each cylinderful of air is compressed, it is forced into a sheet-iron or sheet-steel tank called a receiver. This receiver is cylindrical in form, and serves as a reservoir of compressed air for supplying the machine which is operated by air pressure. The receiver is often provided with an arrangement for cooling the contained air by water. While it is advantageous for the reason given above to keep the air as cool as possible during compression and while it remains in the receiver, as soon as it leaves the receiver heating it is an advantage, for the reason that by this heating its volume or its pressure is increased. So important is this advantage, theoretically, that devices called reheaters are often employed to heat the air just before it passes to the motor or the tool which it operates. Reheaters are made in many forms, the usual one being a kind of stove or oven through which the air passes by means of a spiral pipe or some other arrangement which allows it to be quickly heated. Some of the many methods of utilizing compressed air in engineering and the arts are given in the following list of uses, compiled by a prominent American manufacturer of air compressors: Rock drills, coal cutters, pumps, hoisting engines, and other machinery in mines and tunnels, air brakes on railroad and street cars, switches and signals, engines, hoists, cranes, stone carving and boiler calking tools, chipping tools, polishing machines, riveters, punches, hammers, tapping, screwing and drilling machines, stay-bolt cutters, angle iron shears, paint machines, sand blast apparatus, molding machines, wood bundling machines and shop tools of every description, oil fires under ovens, furnaces, and boilers, and in fifty other applications, such as welding, annealing, tempering, oil illuminating lights, pneumatic transmission tubes, street railway motors and mine locomotives, passenger and freight elevators, sheep shearing machines and cloth cutters, railway crossing gates and jacking-up cars, and steering gear of vessels, charging pneumatic dynamite guns and projectiles, and automatic sprinkler systems for fire protection, tunnel driving by the pneumatic process; sinking caissons for structural foundations; pumping wells by air lift pump method; conveying and elevating acids, chemicals, and other liquids; racking off beer in breweries: aërating water supplies of cities, towns, and villages; agitating fluids, such as asphalt, molasses, and chemical solutions; mixing nitro-glycerine; removing hose from mandrels in rubber factories; inflating tires; testing tinware, pipe, hose, and other manufactured products required to stand pressure; increasing and maintaining pressure on hydraulic elevators; sprays of all descriptions, including physicians', hospitals', sanitariums', and baths; spraying solution in the manufacture of silk ribbon; moving and elevating grain, culm, and other material; cleaning carpets, car cushions, etc.; unloading dump cars; raising sunken vessels; supplying divers in submarine operations; refrigerating, ventilating, and cold storage; manufacture of various gases; disposition of sewage: and for a large number of other duties in railroad shops, chemical works, and in connection with a wide variety of experiments and patented processes. For the great majority of these uses an air pressure below 75 pounds per square inch is ample, but for charging the tanks of compressed air locomotives, for liquefying gases, etc., much higher pressures are required. The highest known pressure to which air has been compressed is 4000 atmospheres (about 60,000 pounds) per square inch, but this was a laboratory experiment. The safe limit of pressure for use in the arts to-day is largely determined by the strength of the retaining vessel or reservoir, and has reached its limit at about 3000 pounds per square inch. To obtain these great pressures specially designed air compressors have to be constructed.

For a concise and readable history of air compressors and of the use of compressed air, consult: Saunders, *Compressed Air Production* (New

York, 1902) or Hiscox, *Compressed Air and its Applications* (New York, 1901); for a somewhat more technical discussion of the production and use of compressed air, F. Richards, *Compressed Air* (New York, 1895). The most thorough work in English on compressed air is Weisbach's *Mechanics of Air Machinery* (New York, 1905).

AIR CUSHION, kṳsh′ŭn. A mattress or cushion composed of a bag or sack of air-tight fabric, which can be inflated, and which possesses many advantages of comfort, cleanliness, and portability. Air-beds were known as early as the beginning of the eighteenth century, but, being made of leather, were expensive, and it was only after the invention of air-tight or rubber cloth that they could be constructed at a moderate cost. An air-bed consists of a sack in the form of a mattress, which may be divided into a number of compartments, each air-tight, or, as is more usual at present, it may have a single compartment with the walls tied to each other to preserve its shape when inflated. The bed is supplied with a valve, or valves, through which the air is blown in by a bellows or an air-pump. They are especially valuable in many cases of sickness, and for use by camping parties. Air-inflated pillows are made to go with the mattresses. The air-cushion is another contrivance of the same kind, the layer of rubber being securely pasted or cemented to a layer of strong cloth, the cloth giving strength and the rubber impenetrability, and the whole sack covered with ticking. The chief drawback to these contrivances is their liability to being spoiled by a rent or a puncture.

AIRD, ârd, THOMAS (1802-76). A Scottish poet of considerable talent. He was born at Bowden, in Roxburghshire, was educated at the University of Edinburgh, and gained the friendship of many distinguished men, especially John Wilson, who always spoke of him in very high terms. In 1835 he became editor of *The Dumfries Herald*, a new journal, started on conservative principles, an office which he filled till 1864. His works are not so well known as they deserve to be, from their intrinsic merit. In spite of very warm praise from Carlyle and others, they have failed to secure a large measure of public approbation. *The Devil's Dream* is perhaps an exception to the rest, for it is both well known and admired. There is something almost Dantesque in the stern, intense, and sublime literalness of the conception. Whether the scenes are on a large scale, as in *The Devil's Dream*, or minute, as in *The Summer's Day*, there is the same clear, vigorous, and picturesque word-painting. In 1827 Aird published *Religious Characteristics*, a piece of exalted prose-poetry; in 1845, *The Old Bachelor*, a volume of tales and sketches; in 1848, a collected edition of his poems, a second edition of which appeared in 1856, and in 1852 he edited the select poems of David Macbeth Moir (the "Delta" of *Blackwood's*), prefixing a memoir. See his life and poems, edited by J. Wallace (1878).

AIRD′RIE (Gadhel. Smooth Height; from *aird*, height). A flourishing town in Lanarkshire, Scotland, 11 miles east of Glasgow (Map: Scotland, D 4). The highroad between Edinburgh and Glasgow intersecting it forms its principal street. It has risen rapidly, was incorporated in 1821, and is now one of the most flourishing inland towns in Scotland. Little more than a century ago it consisted of a solitary farmhouse or two, but the abundance of iron and coal found in the vicinity has given its industries an immense impetus. There are also cotton weaving establishments and paper mills. Pop., 1891, municipal borough, 19,135; 1901, 22,288.

AIRE, âr, or **AIRE-SUR-L'ADOUR,** âr′-sṳr′lȧ′dōōr′. A town of the department of Landes, France, picturesquely situated on the slope of a hill on the left bank of the Adour, 112 miles south of Bordeaux (Map: France, F 8). It has been the seat of a bishopric since the fifth century, and its cathedral of St. Wolfram is a fine example of flamboyant Gothic, begun by Cardinal Georges Antoine, under Louis XII., but afterward completed in a mean and paltry style. Aire has also a college and a library. Its industries are not considerable, but its tanyards and hat factories give employment to most of its inhabitants. Pop., 1896, 2434; 1901, 2247.

AIRE, or **AIRE-SUR-LA-LYS,** âr′sṳr-lȧ-lês′. A town of the department of Pas-de-Calais, France, on the Lys and at the junction of three canals, 30 miles southeast from Calais. The town is fortified and well built, but its situation is low and marshy. Its chief buildings are the handsome Gothic church of St. Peter, dating from the fifteenth century, the Hôtel du Baillage or Corps de Garde of the sixteenth century, the Hôtel de Ville, and extensive barracks. It has various domestic manufactures and a trade in agricultural products. Pop., 1901, 8458.

AIREDALE TER′RIER, âr′dāl. See TERRIER.

AIR EN′GINE. See COMPRESSED AIR ENGINE and CALORIC ENGINE.

AIR GUN. An instrument somewhat resembling a sporting rifle, designed to discharge darts or bullets by the elastic force of compressed air. As ordinarily made, an air gun consists essentially of an air chamber or reservoir, usually located in the stock; of a condensing syringe for pumping air into the reservoir, and of a valve operated by a trigger, which admits the compressed air from the reservoir to the barrel behind the bullet. In some weapons of this sort a pressure of as much as 500 pounds is secured in the reservoir. Usually only a portion of the air in the reservoir is used for a single shot, and, therefore, a number of shots may be fired without recharging the reservoir simply by releasing the pull on the trigger immediately and thus closing the valve between the reservoir and barrel after a small portion of the air has escaped. This permits repeating air guns to be made similar in the mechanism for inserting the bullets to repeating fire-arms. Obviously, the pressure in the reservoir decreases with each discharge of air, and, therefore, each succeeding bullet is discharged with less force than the preceding one. At best, the force with which a bullet is discharged from an air gun is much less than is given by gunpowder. Sometimes air guns are made in the form of canes or walking sticks, which, like sword canes, are carried for purposes of personal defense in sudden emergencies. The range of an air gun of the ordinary kind is from 180 to 250 feet. The air gun was known in France over two centuries ago, and the ancients were acquainted with a device by which air acted on the short arm of a lever, the longer.

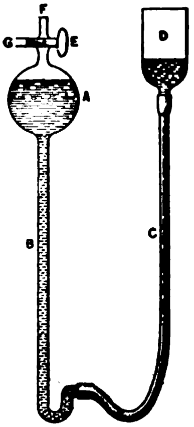
arm of which was used to propel a bullet. In 1886 Lieutenant E. L. Zalinski of the United States Army invented a pneumatic gun for throwing projectiles filled with dynamite; and later the *Vesuvius* was built for the United States Navy and equipped with three of these guns. This vessel was used during the blockade of Santiago Harbor in the Spanish-American War of 1898. During the Brazilian civil war of 1893 the *Nictheroy* was equipped with a pneumatic gun 50 feet long and of 15 inches calibre. The conclusions of experience with both sets of guns was that the range of the gun was too small and the accuracy of its fire insufficient to make it a serviceable weapon on shipboard. The Sims-Dudley pneumatic gun used in the last Cuban rebellion is a field piece having a range of from 2600 to 3600 yards. It consists of a lower, or combustion, tube 7 feet long and 4½ inches in diameter, and an upper tube, or barrel, 20 feet long and 2½ inches in diameter, mounted on a regular field gun carriage. A cartridge inserted into the breech of the combustion chamber, and containing a 7 to 9 ounce charge of smokeless powder, is fired; this compresses the air in the lower chamber so that it passes into the upper tube or barrel behind the projectile and forces it out. The projectile is a light casing filled with explosive gelatine, which is fired by a time fuse, or by a contact fuse upon striking.

AIROLO, ī-rō'lō (In German, Eriels). A village in Switzerland, in the canton of Ticino, on the upper Ticino, 3755 feet above the sea, 66 miles south of Lucerne, at the south end of the St. Gothard Pass and of the St. Gothard Railway Tunnel (q.v.) (Map: Switzerland C 2). On September 17, 1877, it was two-thirds burned, but later rebuilt in stone. December 27-28, 1898, it was partially destroyed by an avalanche. The inscription, "Suvarov Victor," that was carved in the rocks to commemorate the victory here of the Russians over the French, September 13, 1799, is now obliterated. Pop., 1900, 1628.

AIR PLANT. See Epiphyte.

AIR PORT. See Shipbuilding.

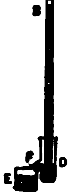
AIR PUMP. An instrument for removing the air from a vessel. These pumps may be divided into two classes, mechanical air pumps and mercurial air pumps. The mechanical air pump was invented by Otto von Guericke about 1654, and a specimen of. his early apparatus is shown in Fig. 1 of the accompanying page illustration. In Fig. 2 is illustrated a modern simple air pump whose essential part is a hollow brass or glass cylinder, in which an air-tight piston is made to move up and down by a rod. From the bottom of the cylinder a connecting tube leads to the space which is to be exhausted, which is usually formed by placing a bell-glass, called the receiver, with edges ground smooth and smeared with lard, on a flat, smooth plate or table. When the piston is at the bottom of the barrel and is then drawn up, it lifts out the air from the barrel, and a portion of the air under the receiver, by its own expansive force, passes through the connecting tube and occupies the space below the piston, which would otherwise be a vacuum. The air in the receiver and barrel is thus *rarefied*. The piston is now forced down, and the effect of this is to close a valve placed at the mouth of the connecting tube and opening inward into the barrel. The air in the barrel is thus cut off from returning into the receiver, and as it becomes condensed forces up a valve in the piston, which opens outward, and thus escapes into the atmosphere. When the piston reaches the bottom and begins to ascend again this valve closes; and the same process is repeated as at the first ascent. Each stroke thus diminishes the quantity of air in the receiver; but from the nature of the process it is evident that the exhaustion can never be complete. Even theoretically there must always be a portion left; and practically the process is limited by the elastic force of the remaining air being no longer sufficient to open the valves. The degree of rarefaction is indicated by a gauge, on the barometer principle. As this air pump only withdraws the air at the rate of one cylinder full for a double stroke of the piston, pumps with two barrels are frequently used, in which case the pistons are each attached to the same handle but each moves in an opposite direction to the other, the object being to double the work done at each stroke of the handle. Such a pump is illustrated in Fig. 5 of the page plate. A large number of modifications of this type of pump have been invented, all of which are the same in general principles. There are several reasons why such pumps do not continue the process of rarefaction indefinitely, but after a certain stage their effects cease and the tension of the air undergoes no further change. Leakage at various joints in the pump is one limiting cause to the action of the machine. It is impossible to prevent leakage entirely, and at the beginning of the operation the quantity of air which enters the receiver through leakage is very small in comparison with the amount pumped out. But as the exhaustion proceeds the leakage is faster on account of the reduced pressure in the receiver, and finally a limiting point is reached when the inflow and outflow are equal and no reduction in the tension of the air takes place. Another limit to the action of this machine is caused by the fact that there must always be some space between the bottom of the piston and the lower end of the cylinder, which is untraversed by the piston. At the beginning of the operation this space contains air at atmospheric pressure, which is rarefied at each stroke of the piston; but some tension always remains there, and when the air of the receiver reaches the same tension no further effect will be produced by the pump. A greatly improved type of mechanical air pump, known as the Geryk, in which the piston and valves are always covered with a quantity of oil, so that the pump has virtually a liquid piston and liquid valves, has recently come into wide use for commercial and laboratory purposes. The oil used in the cylinder must have a very low vapor tension, which requirement is met by oils of high boiling point. With a pump of this sort, having two cylinders working in series, a vacuum of one five hundred thousandth of an atmosphere may be rapidly obtained. For the production of very high degrees of exhaustion, the more slowly working mercurial air pump is used. The principle of the mercurial air pump was first known in the seventeenth century, when Torricelli showed how to produce a vacuum by filling a tube over 30 inches long and closed at one end, with mercury, and then inverting the tube, with the open end temporarily closed, in a vessel containing the same liquid. The mercury in the tube then descends to a height equal to that of the barometer above the level of the mercury in the lower cup, and a vacuum is left in the top of the tube. This is always alluded to as a Torricellian vacuum, and is found in the ordinary barometer. In 1855, Geissler invented a mercurial air pump in which the vacuum is produced by connecting a receiver with a Torricellian vacuum. The original form of Geissler's pump is shown in the accompanying diagram, which will serve to illustrate the principle of the operation of pumps of this class, though they have received numerous modifications and improvements. In most mercury pumps the parts are made of glass, the connections being made with rubber tubing. In the diagram, *A* is a large bulb, *B* is a tube about 3 feet long, *C* a rubber tube uniting the lower end of *B* with the vessel *D*, which is open on top. *A* can be connected with either of the tubes *G* or *F*, but not with both at once, or it can be shut off from both. The receiver to be exhausted is connected with *G*, and *F* leads to the open air. Enough mrecury is used to fill *A*, *B*, *C*, and *D*, as shown, and the vessel *D* is capable of being raised or lowered. The operation of the pump is as follows: Suppose the vessel *D* is raised a little higher than *A*, as in the figure. The mercury will flow into the bulb *A*, which it fills if the cock *E* is turned so as to connect *A* with the outside air, *F*. The cock is then turned so as to connect *A* through the tube *G* with the vessel to be exhausted, the air in which at this stage is at atmospheric pressure. *D* is then lowered, and the level of the mercury in *A* is lowered in consequence, the mercury running down *B* and *C* to *D*. As the mercury in *A* descends, air is drawn from the receiver through *G* into *A*, so when the mercury has descended below *A* the whole space is filled with the air drawn through *G*, which, having expanded from the receiver attached to *G*, is at less than atmospheric pressure. The cock *E* is then turned so as to cut off communication between *A* and *G*. *D* is then slowly raised, and the mercury flows gradually back into *A*, compressing the air above it until it is at atmospheric pressure. At this point the cock *E* should be turned to connect *A* with the outside air *F*, and as *D* continues rising the mercury continues to drive out all the air at *F*, until the bulb *A* is filled with mercury to the cock *E*, which is then closed so as to cut off all communication with *A*. When *D* is again lowered, the mercury does not begin to fall in *A* until *D* is about 30 inches below *A*. It then begins to descend, leaving a Torricellian vacuum above it, and *D* is lowered until *A* is empty. The cock is then turned so as to connect *A* with the receiver through *G*, and the remaining air in that vessel expands and fills *A*. The cock *E* is next turned off, *D* is raised, and the mercury rising in *A* compresses the air above it until it is let out at *F* by turning the cock. By repeating this operation a sufficient number of times a vacuum is gradually produced in the receiver connected to *G*. When the operation is nearly finished great care must be taken not to raise the vessel *D* too rapidly, or the impact of the mercury against the top of the bulb *A* will break the apparatus. It will also be seen that when the vacuum is nearly reached the mercury in *A* will be at the top of the bulb when *D* is about 30 inches below. If the valve should be turned to *F* at this point, the inrush of air would drive the mercury down. Therefore, no communication between *A* and *F* must be made until *D* has been raised on a level with *E*, and no communication between *G* and *A* must be made until *D* is lowered 30 inches again, otherwise mercury will run through *G* into the receiver which is being exhausted.



GEISSLER PUMP.

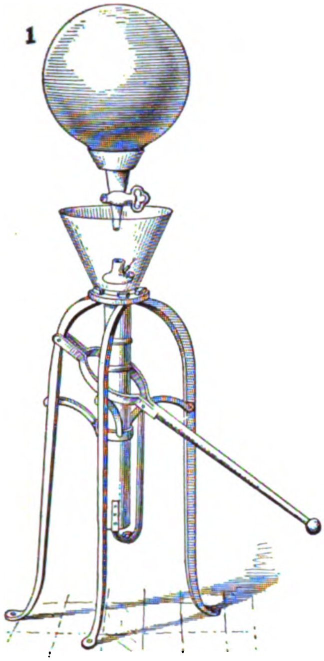
The Geissler pump just described may be taken as the type of mercury pumps, which are classified as upward driving, and, while a number of improvements in details have been introduced, making them of a more practical type for factory use, these pumps all operate on the principle of connecting the receiver to be exhausted with Torricellian vacuum.

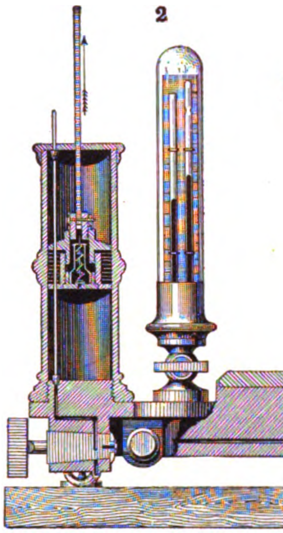
Sprengel brought out his well-known form of mercury pump in 1865, and the diagram shows it in its simplest form. The Sprengel pump is a general type of what are classified as downward-driving pumps. *A* is a funnel having a stop-cock *C*, and *B* is a tube of small bore, called the shaft or fall-tube. The receiver to be exhausted is connected to the tube *G*, which branches off from near the top of the shaft. The tube *B* terminates very close to the bottom of the vessel *D*, which is provided with a spout *F*, as shown, leading to the cup *E*. The distance from the branch *G* to the top of the mercury in the vessel *F* must be at least three feet. *A* is filled with mercury, which flows down the shaft *B*, the rate of flow being regulated by the cock *C*, so that a very small stream is allowed to fall. This mercury in falling breaks up into short lengths, between which are small columns of air which flow in at the junction of *G* with the shaft *B*. The weight of the mercury forces these short columns of air down the shaft *B* to the mercury in *D*, from the surface of which they escape. The mercury as it runs into the cup *E* must be poured back into the funnel *A*. This operation continues until no more air is carried down with the mercury. When the vacuum is nearly completed, the mercury in the fall-tube will fall with a sharp, rattling noise, showing that there is not enough air carried down with it to act as a cushion. With all kinds of mercury pumps, however, it is necessary to continue the operation for a considerable time after the receiver is apparently exhausted. Even when no more air appears to be carried on by the pump, the vacuum will improve as the operation continues. The reason for this is that the air sticks to the surface of the glass, forming a sort of coating, which is swept off the surface by the pump, but very slowly. The simple form of Sprengel pump is better than the simple Geissler pump, but is not well suited to fac-

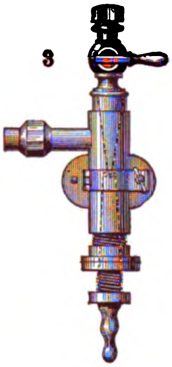


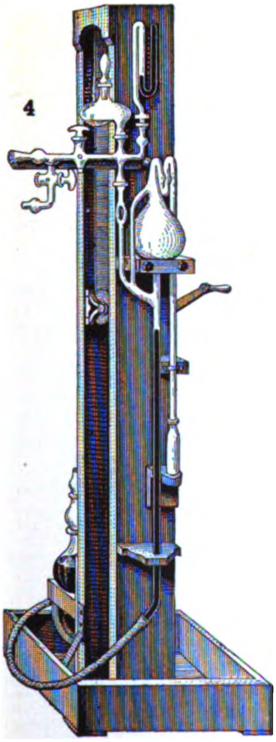
SPRENGEL PUMP.

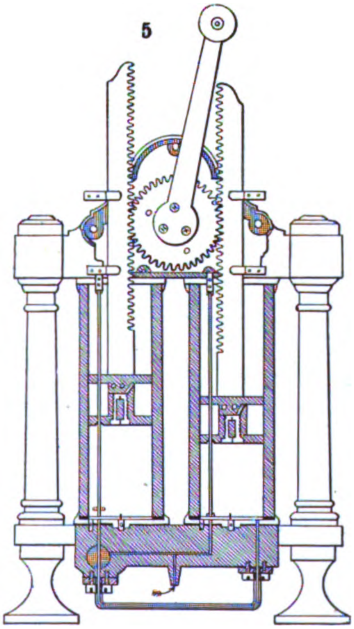
AIR PUMPS

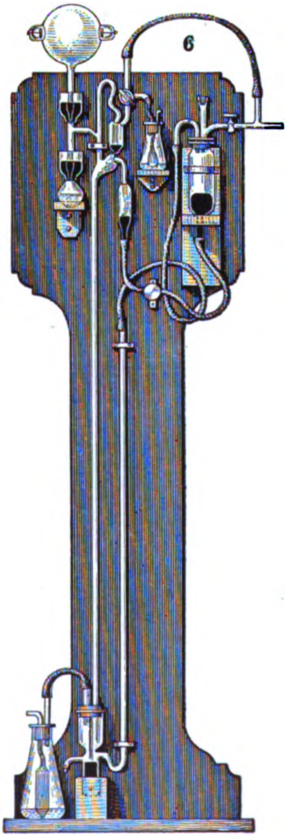












1. **APPARATUS OF OTTO VON GUERICKE with water receptacle at base removed.**
2. **SECTION OF SIMPLE AIR PUMP.**
3. **BUNSEN WATER PUMP.**
4. **MERCURIAL AIR PUMP, Töpler-Hagen form with improvements.**
5. **MECHANICAL AIR PUMP, with two vertical cylinders.**
6. **SELF-ACTING SPRENGEL MERCURIAL AIR PUMP, with auxiliary water pump.**

tory work on account of the slowness of its action. The drawback is overcome, to a great extent, by supplying the pump with a number of fall-tubes, which act together as a single one. For example, if six fall-tubes are used, the work of removing the most of the air is done in one-sixth of the time required by a single pump. After the greater part of the air is removed, however, the time taken to produce a good vacuum is not nearly so much reduced, and it is chiefly in the early part of the operation where the saving of time is effected. Another drawback to all mercury pumps is their liability to breakage, even with the most careful usage. In the Sprengel pump, owing to the continual hammering of the mercury, the fall-tubes are very often broken, even after only a very short usage. A method is in use with both of these forms of pumps which consists of exhausting into a partial vacuum instead of into the atmosphere. This is accomplished by inclosing the part of the apparatus where the air is expelled in a chamber which is kept at a partial vacuum by means of a mechanical or water air pump. By this means the mercury pump will work against a pressure much less than the atmospheric pressure, and consequently the fall-tubes and the height to which the mercury must be raised can be very much reduced, while the air is much more readily drawn down and out of the fall-tubes. In factory work the raising of the mercury from the lower to the upper level of the pumps is done mechanically and not by hand. It may be raised by a force-pump, or in small buckets on an endless chain, or by air pressure. The latter may be simply atmospheric pressure, and the mercury is raised by being broken up into small lengths with air spaces between, like a Sprengel pump working upward into a vacuum chamber. The illustrations show modern forms of mercury pumps. In an improved form of Sprengel pump designed by G. W. A. Kahlbaum a steel gun-barrel replaces the glass fall-tube. This avoids the electrification of the glass by the friction of the falling mercury, and with the other improvements introduced enables a higher vacuum to be attained than ever previously. In this way, in 1901, he was able to obtain a degree of exhaustion corresponding to a pressure of .0000018 millimeters of mercury, which is considered the best on record.

The degrees of exhaustion reached by the various mercurial air pumps may be seen from the following table adapted from Müller-Pouillet, *Lehrbuch der Physik:*

Instrument.	Observer.	Minimum of pressure obtained, expressed in millimeters.	Amount of exhaustion, in fractions of an atmosphere.
GEISSLER'S PUMP. (Older type.)	Bessel-Hagen.	.11	$\frac{1}{6,909}$
KRAVOGL'S PUMP.	V. Waltenhofen.	.0316	$\frac{1}{24,000}$
GEISSLER'S PUMP. (Later type.)	Bessel-Hagen.	.0082	$\frac{1}{92,683}$
SPRENGEL-GIMINGHAM PUMP.	Crookes.	.000046	$\frac{1}{17,000,000}$
TÖPLER PUMP. (Later type.)	Bessel-Hagen.	.000009	$\frac{1}{84,000,000}$
SPRENGEL-GIMINGHAM PUMP. (With improvements.)	Rood.	.0000069 .000002	$\frac{1}{110,000,000}$ $\frac{1}{390,000,000}$
SPRENGEL PUMP. (With improvements, 1901.)	Kahlbaum.	.0000018	$\frac{1}{420,000,000}$

The water pump invented by Bunsen is a simple form of apparatus that is found generally in physical and chemical laboratories, and adequately answers when too high a degree of exhaustion is not required. It consists of a tube attached to a faucet or other supply of water under pressure, through which water empties into a chamber provided with two outlets. From one of these the water flows out, carrying with it the air from the vessel to be exhausted, which is connected with the second tube. In its original form this piece of apparatus was made of glass and rubber tube, but with metallic parts that allow it to be connected to an ordinary faucet. It is extensively used in laboratories. The page illustration (Fig. 3) shows one form of such a water pump. Descriptions of air pumps of various forms are to be found in all the large treatises on physics, including those of Ganot, Deschanel, and Müller-Pouillet (Brunswick, 1886), the latter (in German) giving a complete account of the most important types of apparatus of this class. In the *Journal of the Society of Arts*, Volume XXXVI. (London, 1888), there is an interesting and valuable article on "The Development of the Mercurial Air Pump," by S. P. Thompson, in which the various forms of this instrument are described. This has been reprinted in book form. The reader is also referred to the columns of the *Annalen der Physik und Chemie* and the *American Journal of Science*, in which are described many forms of air pumps and vacuum apparatus.

AIR RESIST'ANCE OF A PROJECTILE. See BALLISTICS.

AIRY, âr'ĭ, SIR GEORGE BIDDELL (1801-92). An English astronomer. He was born at Alnwick, Northumberland, and graduated at Trinity College, Cambridge, in 1819. In 1825, he discovered the optical defect of astigmatism and provided a corrective for it. He was elected to the Plumian professorship at Cambridge in 1828, and intrusted with the management of the Cambridge Observatory, the results of his labors being published in the compilation entitled *Astronomical Observations*, 9 volumes (Cambridge, 1829-38), which became the model of all analogous works since published in Great Britain. In 1836 he succeeded Pond as royal astronomer of the Greenwich Observatory, where he introduced or perfected numerous astronomical instruments, devised clearer and quicker methods of calculation, and instituted valuable researches in magnetism, meteorology, and photography. One of his most important achievements was the establishment of a mechanical device in the form of magnets and iron, whereby the disturbance of the compass in iron-built vessels can be rectified. It was he, also, who conducted the astronomical observations preparatory to the definition of the boundary between Canada and the United States. Among the works written by this distinguished scientist during his exceptionally long and useful career, the following are especially noteworthy: *Gravitation*, for the *Penny Cyclopædia*, also published separately (1885); *Mathematical Tracts on Physical Astronomy* (fourth edition, 1858); *Ipswich Lectures on Astronomy* (fourth edition, 1858); *Treatises on Errors of Observation* (1861); *Sound* (1869); *Magnetism* (1870); "Trigonometry," "Figure of the Earth," "Tide and Waves," in *Encyclopædia Metropolitana*.

AÏSH-KUL, ä'êsh-kōōl'. See Ala-Kul.

AISLE, īl (Fr. *aile*, wing, from Lat. *ala*, contracted from *axilla*). An architectural term meaning the lateral section of the interior of any building which is divided by rows of piers or columns. In such interiors the higher and broader central section is called the nave; the narrower, lower sections are the aisles, divided from the nave or from each other by the lines of supports. There are a few cases of such an arrangement in Greek temples. The development of interiors of this type came with the rise of the Christian basilica or church in the fourth century, when the smaller churches had two and the larger ones four aisles on either side of the central nave. In contemporary circular or polygonal buildings — especially baptisteries, mausoleums, and chapels — the central dome was often encircled by one or more concentric lines of arcades, forming aisles with lower ceiling or vault. When, in the Middle Ages, the upper parts of the church—transept and choir—were so much enlarged under monastic influence and the development of cathedral architecture, then the aisles were continued around the transept and the apse, thus adding great richness to the interiors. In a few cases there were as many as three aisles on each side of the church. They varied very much in height, according to schools, periods, and methods of construction; and in some schools (Lombard, Norman, Byzantine, Early Gothic, etc.), they were surmounted by open galleries, and sometimes by closed galleries (south of France); while in other cases, especially in the early vaulted Romanesque, the vaults of the aisles reached almost as high as those of the nave.

There are several improper uses of the term: in the case of hall-churches with two, three, or more naves of equal height, these divisions are sometimes incorrectly called aisles. Also, in modern usage it is wrongly applied to the passageway between two rows of seats in a building. See Church.

AISNE, ān. A tributary of the Oise, which rises in the department of Meuse, France. It flows northwest through the departments of Ardennes, Aisne, and part of Oise, where it falls into the river Oise above Compiègne (Map: France, K 2). Its length is 170 miles, of which 34 are navigable. It is connected with the Meuse and Marne rivers by canals.

AISNE, ān. A department in the north of France (q.v.), formed of parts of the old Picardie, Bril, and Île-de-France. Capital, Laon.

AÏSSÉ, ä'ē-sä', Mademoiselle (1694?-1733). A French writer, born in Circassia. She was taken captive by a Turkish marauding expedition, and about 1698 was bought at the Constantinople slave market by the Comte de Ferriol, the French ambassador. She was educated at Paris, where she was subsequently a prominent figure in many salons. Her letters to Mme. Calandrini were first published in 1787, with notes by Voltaire. In 1847 a critical edition was published by M. J. Ravenel, with a study by Sainte-Beuve.

AISTULF, īs'tụlf, or **ASTOLF**, äs'tŏlf (died 756). A king of the Lombards. He succeeded Rachis, who entered a monastery in 749. In 751 he seized Ravenna, and soon after attempted to capture Rome. The Pope, unable to get aid from the Emperor at Constantinople, went to implore assistance from Pepin (q.v.). The latter, in 754, invaded Italy, defeated Aistulf, and forced him to promise to give up the conquered territory. This Aistulf did not do, but in January, 756, laid siege to Rome. Pepin again went to aid the Pope, besieged Aistulf, who had left Rome on learning of Pepin's advance, in Pavia, and forced him to surrender the Exarchate of Ravenna. (See Donation of Pepin.) The dates, which were disputed, are discussed and fixed in Gregorovius, *City of Rome in the Middle Ages*, Volume II. (London, 1896).

AITKEN, āt'kĕn, Robert (1734-1802). A Scotch-American printer and bookseller. He was publisher of the *Pennsylvania Magazine*, or *American Monthly Museum*, in 1775 and 1776. and in 1777 was imprisoned as a sympathizer with the Patriot cause. At a considerable loss, he printed the first American edition of the Bible (1782). He is supposed to have written *An Inquiry Concerning the Principles of a Commercial System for the United States* (1787).

AITKEN, William Hay Macdowall Hunter (1841—). A Church of England preacher, born in Liverpool, September 21, 1841, B.A., Oxford, 1865, M.A., 1867. Since 1877 he has been general superintendent of the Church of England Parochial Mission Society, which he founded in 1876. He is one of the most eminent and successful of revival preachers. His publications consist of sermons. In 1900 he was appointed canon of Norwich.

AIT'KENITES. In the Church of England, the partisans of Robert Aitken (1800-73), a clergyman who had been for a time a Wesleyan, and who, after 1840, having returned to the Established Church, desired to combine with its ecclesiastical practice certain views of the Methodists, especially in regard to conversion.

AITON, ā'ton, William (1731-93). A Scotch botanist. He was trained as a gardener, and in 1754 became assistant to Philip Miller, superintendent of the garden at Chelsea. In 1759, he was made director of the royal botanical gardens at Kew, which he rendered the richest in existence, and held the place until his death. In 1793, he published his excellent work, *Hortus Kewensis, or a Catalogue of the Plants Culti-*

vated in the Royal Botanical Gardens at Kew. This was re-edited by his son and successor in office, William Townsend Aiton.

AIVALIK, ī′vȧ-lēk′. A seaport town on the western coast of Asia Minor, on the Gulf of Adramyti, opposite the island of Mitylene (Map: Turkey in Asia, B 3). It has a large trade in oil. Its harbor is extensive, but the entrance is very shallow. The town suffered terribly at the hands of the Turks at the beginning of the nineteenth century, but has recovered since, and is now of considerable importance. Its population, estimated at 30,000, is almost exclusively Greek.

AIVAZOVSKI, ī′vȧ-zŏf′skē, Ivan Konstantinovitch (1817-1900). A Russian painter. He was born in Feodosia, in the Crimea, and by express command of the Czar Nicholas was admitted as an imperial pensioner to the Academy of Art at St. Petersburg. He was one of the greatest marine painters of Russia, his subjects being taken largely from the naval history of that country. Among his best productions may be mentioned: "Sunrise on the Black Sea" (1850); "Creation," "Deluge," and several others, now at the Hermitage at St. Petersburg (1865); "Sea Fights at Revel, Viborg, and Tchesme," "Wreck of the Frigate Ingermannland," "Peter the Great at Krasnaya Gorka" (all at the Winter Palace, St. Petersburg); "View of Constantinople," "Calm Sea," and "Naples by Moonlight" (Academy of St. Petersburg); "Solar Eclipse" (Geographical Society, St. Petersburg); "Lighted Castle on the Sea" (Peterhof); "Calm Sea by Moonlight," "Monastery of St. George" (Moscow Museum).

AIWALYK. See Aivalik.

AIX, åks *or* ås (Anciently Lat. *Aquæ Sextiæ*, Springs of Sextius). A town of France, formerly the capital of Provence, now the capital of an arrondissement in the department of Bouches-du-Rhône (Map: France, M 8). The principal buildings of the town are the Palais de Justice, the Hôtel de Ville, and the cathedral of St. Sauveur. The cathedral dates from the eleventh century, and is a fine example of Romanesque architecture. The Palais de Justice was not completed until 1831, and is in the Renaissance style. The town is very bright and cheerful in appearance, and its many squares and parks enliven every quarter. Aix is famous for its springs and natural fountains. That of the Rotunda is decorated with statues of Justice, Agriculture, and Art; another fountain is surmounted by a statue of René of Anjou, the patron of troubadours. It is the work of David. There is a museum of antiquities containing valuable Gallic, Roman, and Christian remains. The town has a university in conjunction with Marseilles (see Aix, Facultés d'), as well as an academy of sciences. Its library is famous in southern France, and contains about 150,000 printed works and over 1200 manuscripts; among these latter are many letters of Mary Stuart. There is also a school of art, and a picture gallery, in which are examples of Granet, the great architectural painter, who was a native of Aix. The industry of the town consists chiefly in the cultivation of the olive, in cotton-spinning, leather-dressing, and trade in oil, wine, almonds, etc. The warm springs are slightly sulphurous, with a temperature from 90° to 100° F., clear and transparent, with a slightly bitter taste. They have the reputation of improving the beauty of the skin.

Aix was in Roman times Aquæ Sextiæ, from Caius Sextius Calvinus, who in 123 B.C. headed the Roman colony which had been formed to defend the Greeks of Marseilles against the Salluvii. The field on which Marius defeated the Teutones and Ambrones, in 102 B.C., lies in the plain between Aix and Arles. In the Middle Ages, under the counts of Provence (see René), Aix was long a great literary centre. Pop., 1896, 28,900; 1901, 29,418.

AIX, or **AIX-LES-BAINS**, -lā′băn′ (Fr. the Bath Waters or Springs; see below). A small town of Savoy, France, in a delightful valley near Lake Bourget, 7 miles north of Chambéry (Map: France, M 6). Its celebrity as the source of medicinal waters dates from the Roman occupation. The Romans gave it the name of Aquæ Gratinæ, and built splendid baths there; among its numerous remains of Roman times are the Arch of Campanus and the ruins of a temple and of a *vaporarium.* The hot springs, two in number, are of sulphurous quality, and of a temperature above 100° F. They are used both for drinking and as baths, and attract annually two thousand invalid visitors. Pop., 1901, 5349.

AIX, Facultés d', fȧ′kul′tā′ dāks′ *or* dās′, or Académie, ȧ′kȧ′dā′mē′. Schools of law and theology existed at Aix perhaps at the beginning of the thirteenth century. They were organized in 1409 by Papal bull into the University of Aix, which represented Provençal learning, if not literature, during most of its existence from its foundation until its dissolution and reorganization under Napoleon, in 1808, after which for nearly a century it was an academy of the University of France. The present University of Aix-Marseilles has faculties of law and literature at Aix, and faculties of mathematics-science, medicine-pharmacy, and the free faculty of law at Marseilles. There are 1050 students.

AIX-LA-CHAPELLE, -lȧ-shȧ′pĕl′, Ger. Aachen (named from its springs, Lat. *Aquæ*, and the palace chapel). A city of the Prussian Rhine Province, and capital of the government district of the same name, situated in a valley near the River Wurm, about 40 miles west of Cologne (Map: Prussia, B 3). The city is divided into the inner or old town, the outer or new town, and the suburb of Burtscheid. The streets are generally broad and well paved. Among the principal ones are the Theaterstrasse, Hochstrasse, and Wilhelmstrasse. The most important public squares are the Marktplatz, with the bronze statue of Charlemagne, the Münsterplatz, and the Kaiserplatz, with a large, handsome fountain. Its private houses are for the most part handsome modern buildings, and give the city a thoroughly modern appearance. With the exception of its two or three public buildings and churches, little of the ancient town remains. Its former ramparts have been leveled and turned into promenades, and only two of its old gates remain standing. Foremost among the public buildings of interest is the cathedral, a most striking specimen of various styles of ecclesiastical architecture. The oldest portion, which probably dates from the year 796 A.D., is an octagonal chapel, surrounded by a gallery and surmounted by a cupola built in the Byzantine style. A stone in the floor marks the supposed burial place of Charlemagne, and above it hangs an immense chandelier of gilded copper. The choir, dating from the fourteenth century, and built in the Gothic style, marks the second period of construction. The Hungarian Chapel, built in the early part of the eighteenth century, contains the sacred relics, which are exhibited to the populace every seven years. The other churches of great age are those of St. Foilan and St. Paul, with fine stained glass windows. In the Marktplatz stands the Gothic Rathhaus, built on the site of Charlemagne's palace, and containing the famous and immense coronation hall of the German emperors, decorated with frescoes depicting scenes from the life of Charlemagne. The Rathhaus is flanked by two towers, one of which, the Granusturm, dates from the thirteenth century.

The city's affairs are directed by a municipal council of thirty members and an executive board of five. Aix-la-Chapelle has an excellent system of sewers, which carry the refuse into the river. The yearly expenditure is about $2000, or about 2½ cents per capita, compared to Potsdam's per capita expenditure of about 21 cents. The city has owned and operated since 1880 large water works, which net it annually about $35,000. It has an organized fire department, upon which it expends annually the sum of about $16,000. The gas works are in the hands of private companies, which pay the city a tax of about half a cent for each cubic meter sold for lighting purposes, and about a quarter of a cent on each cubic meter sold for cooking purposes. The city owns an electric light plant, which, however, is leased to a private company. Aix-la-Chapelle has quite a number of parks and promenades, including a municipal botanical garden, on which it expends annually about $13,000. Its educational institutions include free gymnasiums, a splendidly equipped technical high school, an industrial high school, an art school, a teachers' preparatory school, and a deaf and dumb school. There are six public libraries, including the municipal library, containing about 100,000 volumes. The commerce of Aix-la-Chapelle is of considerable importance. Its principal industry is wool-spinning and the manufacture of cloth, which is exported to all parts of the world. There are also important manufactures of needles, glass buttons, knives, umbrellas, soap, cement, bells, pottery, and crockery. Aix-la-Chapelle is advantageously situated as a commercial centre, being on the Prussian State Railway and on the line to Antwerp. Local traffic facilities are afforded by electric street railway lines within the city, connecting it also with many of the neighboring towns. The hot sulphur springs of Aix-la-Chapelle are celebrated. They are frequented yearly by about 20,000 visitors. The principal spring is the Kaiserquelle, with a temperature of 136° F. In 1890 the population of Aix-la-Chapelle was over 103,000; in 1900, 135,235; in 1905, 144,095.

Aix-la-Chapelle was called Aquisgranum by the Romans, who frequented the place in great numbers on account of its warm springs. Under the Frankish emperors it enjoyed great prosperity. Pepin erected here a fine palace in 765; Charlemagne made the city his home and lavished favors upon it. Between 813 and 1531, the Roman emperors were crowned in Aix-la-Chapelle, and seventeen imperial diets assembled there. Prior to the Reformation, Aix-la-Chapelle was one of the most flourishing of the free imperial cities of Germany. The removal of the imperial coronations to Frankfort marked the end of a city's splendor, while the religious troubles of the sixteenth and seventeenth centuries, and a disastrous fire in 1656 hastened its decline. In 1793 it was taken by the French, but was ceded to Prussia in 1815. Consult: Stübben, "Aachens Bebauungsplan und Bauliche Zukunft," in the *Deutsche Bauzeitung* (Berlin, 1880); Drapeyron, "Aix-la-Chapelle et Charlemagne," in the *Revue de Géographie*, Volumes XLV. and XLVI. (Paris, 1899); "Reformationsgeschichte Aachens," in the *Historische Politische Blätter*, Volume CXXVIII. (Munich, 1901).

TREATIES OF PEACE, and CONGRESS OF AIX-LA-CHAPELLE. The first peace of Aix-la-Chapelle ended the war carried on between France and Spain for the possession of the Spanish Netherlands, known as the War of Devolution. On the death of Philip IV., Louis XIV. laid claim to a large portion of those territories in the name of his wife, Maria Theresa, the daughter of Philip, urging the law of succession prevailing in Brabant and Namur respecting private property. The victorious progress of Louis was checked by the triple alliance between England, Holland, and Sweden, and a treaty of peace was concluded at Aix-la-Chapelle in 1668, by which France retained possession of the fortresses of Charleroi and Lille, which she had already taken, but gave back Franche Comté to Spain.

The second peace of Aix-la-Chapelle concluded the War of the Austrian Succession (1748). (See SUCCESSION, WARS OF.) In general the possessions of the several states remained as before the war. Austria ceded Parma, Piacenza, and Guastalla to the Spanish infante, Philip; and the possession of Silesia and Glatz was guaranteed to Prussia. The privilege of the Assiento Treaty (q.v.) was confirmed to England for four years, and the Pretender was expelled from France. Owing chiefly to the exertions of her minister, Kaunitz, Austria came off with but small sacrifice, and obtained a ratification of the Pragmatic Sanction (q.v.) from the signatory powers.

The Congress of Aix-la-Chapelle was held in 1818, for regulating the affairs of Europe after the Napoleonic wars. The emperors of Russia and Austria and the King of Prussia were personally present. The plenipotentiaries were Metternich, Castlereagh, and Wellington, Hardenberg and Bernstorff, Nesselrode, and Capo d'Istrias, with Richelieu on the part of France. France was admitted to take part in the deliberations as one of the five great powers of Europe, who proceeded thereupon to sign a protocol announcing a policy known as that of the "Holy Alliance" (q.v.). An important result of the Congress achieved by Richelieu was the immediate evacuation of France by the foreign forces. Consult de Broglie, *La paix d'Aix-la-Chapelle* (Paris, 1892).

AIZANI, ī-zä′nī, or **AZANI**, ȧ-zä′nī. A city in Phrygia. In 1824, its remains were found by the Earl of Ashburnham, about 30 miles southwest of Kutaieh. There was a temple of Zeus, a theatre, a stadium, and a gymnasium. The theatre is in good preservation—with a diameter of 185 feet; it had fifteen rows of marble seats. The Rhyndacus (now Adranus) rises near the site of Azani and passes through it; it was crossed by two white marble bridges, each of five semi-circular arches. Tombs, Roman coins, and inscriptions have been found. It is mentioned by Strabo.

AIZELIN, ā'z'-lăN', EUGÈNE ANTOINE (1821—?). A French sculptor. He was born at Paris, and studied with Ramey and Dumont at the Ecole des Beaux-Arts. Among his numerous works may be mentioned: "Nyssia au Bain" (1859, now in the Palais Pompéian on the Avenue Montaigne, Paris); "Psyché" (1863, Musée du Luxembourg); "L'Adolescence" (1868); "L'Idylle" (1872, for the court of the Louvre); "Amazone Vaincue" (1876); "Mignon" (1880); "Agar et Ismaël" (1888). He also executed the group entitled "La Danse" for the façades of Le Cirque, and a number of statues for the Théâtre du Châtelet, the Église de la Trinité, and other public buildings.

AJACCIO, ȧ-yä'chō. The capital of the French department of Corsica, comprising the whole of the island (Map: France, Corsica, P 9). It is a seaport with a well-sheltered harbor, and stands on the west coast, in a fertile belt of land known as Campo d'Oro. Its cathedral dates from 1585, and the house of Napoleon, who was born in Ajaccio, August 15, 1769, is still standing. A marble statue of the First Consul is seen in the main square. The chief employments are the anchovy and pearl fisheries, and the trade in wine and olive-oil, which the neighborhood produces in abundance, and of good quality. The harbor is protected by a strong fort. Pop., 1901, 21,779. Consult: O. Joanne, *Ajaccio et ses environs* (Paris, 1899).

AJALON, ăj'ȧ-lŏn, or **AIJALON,** ā'jȧ-lŏn (R. V.). A town in ancient Palestine, 14 miles northwest of Jerusalem, where Joshua commanded the moon to stay its course till he had finished his battle (Joshua x: 13). It was given to Dan (Joshua xix : 42), who, however, could not keep it from the Amorites, who had it in the pre-monarchial period (Judges i : 35). Rehoboam fortified it (II. Chronicles xi : 10), but in Asa's days it passed into the hands of the Philistines (II. Chronicles xxviii: 18). It is mentioned in the Amarna letters (fourteenth century B.C.) under the form Aialuna. The modern village of Yalo represents the ancient site.

AJAWA, ȧ-jä'wȧ. A Bantu tribe of Portuguese East Africa, described by Livingstone. They have acquired some culture from contact with the Arabs. Cannibalism still exists among them, and at the funeral of a chief women are sacrificed; though they are accounted intelligent, industrious, and enterprising, a manly and independent tribe of blacks superior to others in this region.

A'JAX (Lat. form of the Gk. *Αἴας, Aias*). The name of two of the Greek heroes of the Trojan War. One of them was called Ajax the Less, or the Locrian, being the son of Oïleus, King of the Locrians. At the head of forty Locrian ships he sailed against Troy, and was one of the bravest of the Greek heroes; in swiftness of foot he excelled all except Achilles. When Cassandra fled to the temple of Athena, after the taking of Troy, it is said that Ajax tore her from it by force and dragged her away captive. Others make him even violate the prophetess in the temple. Though he exculpated himself by an oath when accused of this crime by Ulysses, yet he did not escape the vengeance of the goddess, who caused him to be engulfed in the waves on his voyage toward Greece.

The other Ajax, called by the Greeks the Greater, was the son of Telamon, King of Salamis, and grandson of Æacus. He sailed against Troy with twelve ships, and is represented by Homer as, next to Achilles, the bravest and handsomest of the Greeks. After the death of Achilles, Ajax and Ulysses contended for the arms of the hero, and when the prize was adjudged to Ulysses, Ajax in a fit of insanity slew the Grecian flocks, fancying he was slaying his enemies. On recovering his reason he threw himself on his sword. Sophocles, in the tragedy of *Ajax*, attributes his madness to the wrath of Athena. See TROJAN WAR.

AJMERE, ăj-mēr'. An ancient city of Rajputana, India, the capital of the British province of Ajmere-Merwara, 228 miles west of Agra (Map: India, B 3.) It is situated in a picturesque and rocky valley at the foot of the mountain of Taragurh, which is crowned by a fort commanding the city. The city is surrounded by a stone wall, with five lofty and handsome gateways on the west and north. Most of the streets are narrow and dirty, but some of them are spacious and contain fine residences, besides mosques and temples of massive architecture. The Daulat Bagh, or "Garden of Splendor," is now the residence of the British commissioner of the province. The tomb of the Mussulman saint, Kwajah, within the town, is held in great veneration, and pilgrimages are made to it even by Hindus. The Emperor Akbar journeyed to it from Agra on foot in 1570, in fulfillment of a vow after the visit of his son Jehangir. In October, a great annual fair is held in honor of the saint, at which presumed miracles are wrought. Ajmere has manufactures of oil, cotton cloths, celebrated dyeing establishments, and a trade in opium and salt. It is the seat of Ajmere College and of Mayo College, a secondary institution opened in 1875. The Anasagar, a large artificial lake to the north of the city, supplies it with water. Ajmere dates from about 145 A.D.; it came under British rule by purchase in 1818. Pop., 1891, 68,800; 1901, 75,800.

AJMERE-MERWARA, -mâr-wä'rȧ. A province of British India. It is situated in Rajputana, between 25° 30' and 26° 45' N. lat. and between 73° 53' and 75° 22' E. long. (Map: India, B 3). It occupies an area of 2711 square miles. The climate is unhealthful and fevers are prevalent. The surface is mountainous in the west, and the soil is naturally unfertile and scantily watered. By irrigation it has been brought to some degree of productivity, and it now yields some cotton, wheat, and other food grains and oil seeds. Iron and a few other metals are found. Pop., 1901, 476,912, as against 542,358 in 1891. The inhabitants are mostly Hindus, the number of Mohammedans being about 72,000, and of Jains, 19,900. The Christians number 3700. The capital is Ajmere (q.v.).

AK'ABAH. A village near the Gulf of Akabah, supposed to occupy the site of the Elath of Scripture (Map: Asia, C 6). Ruins in the Red Sea a short distance to the south still bear the name Ezion-geber. It lies on the route from Egypt to Syria.

AKABAH, GULF OF. Ancient Sinus Ælanites. The eastern of the two inlets on the north end of the Red Sea, running into Arabia Petræa, about 100 miles northeast, with a width of 12 to 17 miles (Map: Asia, C 6). Navigation is difficult on account of reefs and sudden squalls. The only good harbor is Golden Port, on the west shore, 33 miles from the entrance and 29 miles east of Mount Sinai.

AKAKIA, ȧ'kȧ'kē-ȧ', LE DOCTEUR. The name of a noted French physician of the sixteenth century (Martin Akakia, Grecized from the French name *sans-malice*), borrowed as a pseudonym by Voltaire in his *Diatribe du Docteur Akakia*. This was a brilliant satire, covering with ridicule Maupertuis and the Berlin Academy, of which he was president. King Frederick II., however, had it publicly burned (1752).

AKAMAGASEKI, ä'kȧ-mä'gȧ-sä'kė. See SHIMONOSEKI.

AKASHI, ȧ-kä'shė. A town of Japan, in the prefecture of Hiogo, situated on the northern coast of the Inland Sea, and giving its name to the passage between Honshiu and the island of Awaji (Map: Japan, D 6). It is a station on the Sanyo Railway, and it lies twelve miles east of Kobé, whose inhabitants go there for the summer. It contains a Shinto temple in honor of the ancient poet Kaki-no-moto-no-Hitomaro, and the remains of a moat and a large castle. Its meridian is used for the standard time of Japan. Pop., 1898, 21,196.

AKBAR, äk'bẽr; *Hind. pron.* ŭk'bẽr (Ar. very great), properly JALAL-UD-DIN MUHAMMAD (1542-1605). Emperor of Hindustan, the greatest Asiatic monarch of modern times. His father, Humayun, was deprived of the throne of Delhi by usurpers, and fled to Persia. On the way thither, in the town of Amerkote, Akbar was born in 1542. Humayun recovered the throne of Delhi in 1555, after an exile of twelve years, but died within a year. The prince of fourteen at first committed the administration to Bahram Khan as regent minister, but finding this authority degenerating into tyranny, he shook it off by a bold stroke and took the power into his own hands (1560). At this time only a few of the many provinces once subdued by the Mongol invaders were actually subject to the throne of Delhi; in ten or twelve years. Akbar's empire embraced the whole of Hindustan north of the Deccan. The wisdom, vigor, and humanity with which he organized and administered his vast dominions are unexampled in the East. He promoted commerce by constructing roads, establishing a uniform system of weights and measures, and a vigorous police. He exercised the utmost vigilance over his viceroys of provinces and other officers, to see that no extortion was practiced, and that justice was impartially administered to all classes of his subjects. For the adjustment of taxation, the lands were accurately measured, and statistics were taken, not only of the population, but of the resources of each province. He also forbade child-marriage, permitted the remarriage of widows, and endeavored to stop the practice of suttee. In religion Akbar was exceedingly liberal, largely on account of the influence of the vizier Abu-l Fazl. He was fond of inquiries as to religious beliefs, and invited Portuguese missionaries from Goa to his court to give an account of the Christian faith. He even attempted to promulgate a new eclectic religion of his own, which, however, never took root. Literature received the greatest encouragement. Schools were established for the education of both Hindus and Mohammedans; and numbers of Hindu works were translated from Sanskrit into Persian. Abu-l Fazl (q.v.), the able minister of Akbar, has left a valuable history of his master's reign, entitled *Akbar Nāmah* (History of Akbar); the third volume, containing a description of Akbar's empire, derived from the statisticial inquiries above mentioned, and entitled *Ayin-i-Akbar* (Institutes of Akbar), has been translated into English by Gladwin (3 volumes, Calcutta, 1786, and London, 1800), and by Blochmann and Jarett (3 volumes, Calcutta, 1873-94). Akbar's latter days were embittered by the death of two of his sons from dissipation, and by the rebellious conduct of the third, Selim (known as Jehangir), who succeeded his father in 1605, and was suspected of being the cause of his death. Consult Malleson, *Akbar*, Rulers of India Series (Oxford, 1891-1901).

AKEE' (native name, its scientific name being *Cupania* or *Blighia sapida*). A fruit tree of the order Sapindaceæ, a native of tropical Africa, introduced into Jamaica in the latter part of the seventeenth century. It grows to a height of upward of 25 feet, with numerous branches and alternate pinnate leaves resembling those of the ash. The flowers are small, white, on axillary racemes; the fruit is about the size of a goose's egg, with three cells and three seeds, and its succulent aril has a grateful subacid flavor. The fruit is little inferior to a nectarine. Boiled down with sugar and cinnamon, it is used as a remedy for diarrhœa. The distilled water of the flowers is used by negro women as a cosmetic. The akee sometimes produces fruit in hothouses in Great Britain. In order to obtain this the roots should be cramped in pots. The Aki of New Zealand is a totally different plant, *Metrosideros buxifolia*, of the natural order Myrtaceæ, a shrub, which sends out lateral roots, and so attains the summits of the loftiest trees.

FOSSIL FORMS. Under the names Cupanites and Cupanoides, several forms of fruits have been described from the Eocene clays, of the Tertiary age, of Great Britain.

AKEL'DAMA. See ACELDAMA.

À KEM'PIS, THOMAS. See KEMPIS, THOMAS À.

AKENE'. See ACHENE.

A'KENSIDE, MARK (1721-70). An English author of considerable celebrity in his own day, on account of his didactic poem, the *Pleasures of the Imagination*, and some medical works. He was born at Newcastle-on-Tyne, where his father was a butcher. Being intended for the Presbyterian Church, he was sent to study theology at Edinburgh, but soon abandoned it for medicine. He graduated as a physician at Leyden in 1744, and practiced at Northampton, then at Hampstead, and finally in London. His success as a practicing physician was never very great, owing, it is said, to his haughty and pedantic manner. He died in London, soon after being appointed one of the physicians to the Queen. At Leyden he had formed an intimacy with Jeremiah Dyson, and this rich and generous friend allowed him £300 a year. Some of his medical treatises, as that on dysentery, won for him distinction as a scholar. His later poetry, consisting chiefly of odes and hymns, did not attain the same reputation as his *Pleasures of the Imagination*, which was completed in his twenty-third year. In *Peregrine Pickle*, Smollett satirically sketched the character of Akenside under that of the pedant who undertakes to give an entertainment after the manner of the ancients. Akenside, who practiced blank verse and the Spenserian stanza, was one of the pioneers among the romantic poets. He became dissatisfied with his juvenile production, and at his death had written a portion of a new poem on the same subject. Both poems were published in the complete edition of his works in 1772. For his biography consult: Bucke (London, 1832), and Dyce (London, 1866); also Beers, *English Romanticism in the Eighteenth Century* (New York, 1899).

AKERBLAD, ä′kẽr-blȧd, JOHANN DAVID (1760-1819). A Swedish Orientalist and learned epigraphist. He was secretary of the Swedish embassy to Constantinople, whence he went to Jerusalem and the Troad in 1792-97. Later he was *chargé d'affaires* at Paris, but spent his last years in Rome. He published *Inscriptionis Phœniciæ Oxoniensis Interpretatio* (1802) and *Lettre sur l'inscription égyptienne de Rosette* (1802).

AKERMAN. See AKKERMAN.

AKERS, ā′kẽrz, BENJAMIN (PAUL) (1825-61). An American sculptor. He was born in Westbrook, Me., July 10, 1825, and died at Philadelphia, May 21, 1861. While in his father's sawmill he made toys, and turned his original designs into ornamental woodwork. He tried to be a printer, then essayed to paint, but on viewing a plaster cast he decided for sculpture, and placed himself under the instruction of Carew of Boston. In 1852 he went to Florence, where he passed a year in study. In 1854 he visited Rome. While in that city he executed his "Una and the Lion," "Girl Pressing Grapes," "Isaiah," and other works. He remained in Europe until, in 1860, failing health drove him home for a last vain endeavor to recover his strength. Hawthorne referred to his "Milton" and "The Dead Pearl-Diver" in *The Marble Faun;* and it is said that the character of Kenyon in that book is drawn from the personality of the young sculptor. Akers also produced many portrait busts or medallions of distinguished Americans, among them Longfellow, Edward Everett, and Sam Houston. He had, moreover, ability as an art writer, but only a few of his essays have been published.

A′KERSHEM, MISS SOPHRONIA. A character in Dickens's *Our Mutual Friend*. She becomes the wife of Albert Lammle (q.v.).

AKHALTSIKH, ä′ᴋȧl-tsĭᴋ′. The chief town of a district in the government of Tiflis, Russian Armenia, about 95 miles west of Tiflis, and 1450 miles by rail southeast of Moscow, on the banks of the Poskhov-Tchai, an affluent of the Kur (Map: Russia, F 6). It is situated in a valley of the Keldir Mountains, 3376 feet above the sea level. By the river running through it, the town is divided into the old town and citadel, on the left bank, and the new town on the right. The town is not surrounded by walls, for the citadel is considered sufficient protection, it being very strong and built on an almost inaccessible rock. The climate is salubrious, although the winters are very severe and the summers exceedingly hot. The surrounding scenery presents a view of wild, rugged beauty, enhanced by the numerous gardens encircling the town. The mosque of Sultan Ahmed, built on the model of St. Sophia in Constantinople, has a library attached to it which was accounted one of the most valuable in the East; but the Russians carried off a great part of its most valuable treasures to St. Petersburg. Some manufactures, especially of the smaller arms and weapons, are carried on in the town, and it maintains an active trade with various places on the Black Sea. Some 16 miles to the northwest of the town are the well-known Abas-Tumansk mineral springs. Deposits of lignite are also found in the neighborhood. Akhaltsikh was anciently called Keldir or Chaldir. Once a considerable mart for trading in Christian slaves, it has since its occupation by Russia become a Christian town, 80 per cent. of its population being Armenians and 10 per cent. Jews. It is the seat of an archbishopric of the Greek church. In 1828, when the Russians took possession of it, it had a population of 50,000, but it has been decreasing ever since, so that at the time of the taking of the last census, in 1897, there were only 15,300 inhabitants.

AKHISSAR, ăk′hĭs-sär′ (anciently Lat. *Thyatira*, Gk. Θυάτειρα, *Thyateira*). A town in the Turkish vilayet of Smyrna, Asiatic Turkey, situated 52 miles northeast of Smyrna, on somewhat elevated ground in the valley of the Hyllus (Map: Turkey in Asia, B 3). The streets are paved with carved stone, and other relics of antiquity abound, but there are no ruins of ancient buildings. Cotton goods are exported. The town is situated on the Monissa-Soma Railway. Population estimated at from 12,000 to 22,750.

AKHMÎM, ȧᴋ-mēm′, or **EKHMÎM**, ĕᴋ-mēm′. A city of some 10,000 inhabitants, on the right bank of the Nile, in Upper Egypt (Map: Egypt, E 6). It occupies the site of the ancient Chemmis or Panopolis, the seat of worship of the harvest god Min, an ithyphallic deity whom the Greeks identified with Pan. In Christian times the city became an important religious centre, and many converts congregated in the vicinity. Nestorius, patriarch of Constantinople, whose heresy was condemned by the Council of Ephesus, 431, died in banishment at Panopolis.

AKHTYRKA, ȧᴋ-tĭr′kȧ. A town of European Russia, in the government of Kharkov, 72 miles northwest of Kharkov and 520 miles south of Moscow (Map: Russia, D 4). It is situated on a small river of the same name, an affluent of the Dnieper, in a rather low valley, and until very recently was unprotected from annual inundation. Even at present the surrounding country is often submerged, so that at times, especially in the spring, communication with the town becomes very difficult. It is a thriving little town, nevertheless, doing a lively trade with the great pilgrim crowds attracted there by the famous Akhtyr image of the Holy Virgin, and by the Trinity cloister, situated on the outskirts of the town. Some manufacturing is carried on in textiles, boots and shoes, and a great annual fair is held. A considerable commerce is also carried on in grain and cattle. The town was founded by the Poles in 1641 and acquired by the Russians in 1647. Pop., 1897, 23,400.

AKHUND OF SWAT, ȧ-ᴋo͞ond′, swät, THE (?-1878). A Mohammedan saint, who exercised great influence and had almost unquestioned authority over Mohammedans all over Central Asia. His residence in the mountainous country of Swat, on the borders of India and Afghanistan, was the resort of numerous pilgrimages to consult him on questions of every kind. For half a century the English Government assiduously watched this man, who possessed a power which no other person in Asia could pretend to wield; but the Akhund generally kept on friendly terms with the English. In 1877, the Ameer of Afghanistan sought his advice in regard to the proper course in the Russo-Turkish War.

AKIB, ȧ′kēb′, Le Rabbin. The pseudonym under which Voltaire published in 1761 his *Sermon du Rabbin Akib—traduit de l'Hébreu*.

AKIBA, BEN JOSEPH, ȧ-kē′bȧ bĕn jō′zĕf. A famous rabbi and head of a rabbinical school at Bene-Barak, near Jaffa, who flourished in the first and second centuries A.D. Although he began the study of the law at a comparatively advanced age, he rose to a prominent position among the rabbis of his day by virtue of his learning and acumen, and many are the stories and legends told about his early struggles and final success. He laid the basis of the "Mishna" by beginning the systematization of Jewish oral law, and his collection became known as the Mishna of Rabbi Akiba. His influence as a teacher upon the founders of the Mishna was also very great, and it was he likewise who, to a large degree, advanced the peculiar biblical exegesis which is a characteristic feature of Talmudic literature. His scholarship did not weaken Akiba's interest in the political affairs of the day. He was involved in the great Jewish revolt against Rome, arrayed himself on the side of Bar-Cochba, or Bar-Cochebas, the pretended Messiah, and acted for a time as his armor-bearer. He was captured by the Romans and put to death c. 135 A.D. with great tortures, but bore his pains with wonderful fortitude. Legends gathered around the career of Akiba, and, like Moses, he is reported to have been 120 years old at death. His grave, shown at Tiberias, became a place of devout pilgrimage.

AKITA, ȧ-kē′tȧ, or **KUBOTA**, kōō-bō′tȧ. A town of Japan, the capital of the prefecture of the same name, situated on the western coast of Honshiu, near the Hachiro Lagoon (Map: Japan, G 4). It carries on a considerable trade in rice with Hakodate, and has some manufactures of cloth and cotton crape. Pop., 1903, 34,350.

AKKA, ăk′kȧ. A pygmy tribe or race, now living in the forests of British East Africa, about long. 25° E. In height, the Akka average about 4 feet 6 inches; color, yellow brown; features, negroid. They are extremely retiring and do not mix with neighboring tribes, though usually they live near, and are under the protection of, the tall negroes. Their houses are dome-shaped, arranged in a circle, with the communal cooking fire in the centre. Though dwarfs in stature, they do not hesitate to attack large game with poisoned arrows, the python being their favorite quarry. Their food is principally nuts and berries. The Akka tribe presents a difficult ethnological problem, next to nothing being known of their language and customs. Consult: Schweinfurth, *Heart of Africa* (London, 1873); Deniker, *Races of Man* (London, 1900).

AKKAD, ăk′kȧd *or* ăk′kăd. See Accad.

AKKERMAN, ăk′ker-män′. Formerly a fortress, now the chief town of a district in the Government of Bessarabia, Russia, at the mouth of the Dneister, 12 miles from the Black Sea and about 30 miles from Odessa (Map: Russia, C 5). It was the Alba Julia of the Romans. The chief industry of the town is the raising of fruits, especially of grapes, there being no less than 2000 gardens within the city proper, besides numerous other beautiful ones which surround the town. An annual fair is held here during the month of December. The harbor is accessible to large steamers, and the town has regular steamship communication with Odessa, to which it exports salt, fish, wools, and wines. A treaty was signed here between Russia and Turkey in 1826.

AKKESHI, or **AKISHI**, ȧ-kē′shē. A town of Japan, situated on the southern coast of Yezo, on the Akkeshi Bay. It is famous for its oyster beds and contains an oyster-canning establishment.

AKKRA, ȧ-krä′, or **ACCRA**. The chief town of the district of the same name, with a population in 1901 of 143,141, in the British West African colony of the Gold Coast (Map: Africa, D 4). It has a salubrious climate, being separated from the interior of the colony by mountain chains. Although the number of Europeans is comparatively small, the town bears strong marks of European influence. It has several churches, a bank, a club house, and a number of European shops. There is a government school for primary education, to which is attached a school of carpentry and woodwork. The population in 1901 was 14,842.

AK′MOLINSK′. A Russian territory, constituting the northeast and largest section of the Kirghiz Steppes in Russian Asia (Map: Asia, F 3). It lies between the Uln-Tai and Ishim rivers on the west and the Irtysh on the northeast. Area, 229,609 square miles. The entire territory is divided into three sections, greatly differing in their geological aspect. The northern part is a rather low plain, with many salt lakes and salt pits. The middle section, crossed by hillocks, is habitable in parts only. Here are centred the mineral resources of the territory, consisting principally of gold, copper, and coal. The southern portion is a waterless desert-steppe, and is known under the name of Bednak-Dola, meaning "the hungry steppe." Its climate is very severe; it is extremely hot in the summer, and there are epidemics of malaria and diarrhœa. Its principal industries are the growing of flax and tobacco, cattle raising, fishing, and, in some localities, hunting. The mining industry is but little developed. Its population increased from 463,400 in 1887 to 687,900 in 1897; about two-thirds of the people are nomadic. The principal towns are Akmolinsk, Omsk, Atbassar, and Petropavlovsk.

AKOI′METOI. See Accœmetæ.

AK′RAGAS (Gk. 'Ακράγας). The ancient Greek name of the Sicilian city Girgenti. See Agrigentum.

AK′RON. A manufacturing city and railroad centre, the county seat of Summit County, Ohio. It was founded in 1825, and incorporated as a town in 1836. It is 35 miles (direct) south of Cleveland, on the Ohio Canal and the Erie, the Baltimore and Ohio, the Pennsylvania, and other railways. The city is surrounded by a chain of lakes, where hotels, etc., have been established, and their accessibility by electric roads is tending to make Akron attractive as a summer resort. The industries of the city include a great variety of manufactures, among which may be mentioned printing and lithographing, iron, steel, sewer pipes, rubber, pottery, and agricultural implements. The executive power is vested in a mayor, president of the council, boards of public service and public safety, treasurer, and solicitor, all elected for two years, and in an auditor, elected for three years. The city council has ten members, three of whom are elected at large. The board of health consists of five members appointed by the mayor and council. The city's annual income amounts to about $910,000; expenditures to $700,000, of which $260,000 is spent in construction and other capital outlay, and $440,000 in maintenance and operation. The chief items of expense are: police department, $30,000; fire department, $55,000; and schools, $135,000. Akron is the seat of Buchtel College, an institution under Universalist control. The city maintains a hospital and library. Pop., 1870, 10,000; 1890, 27,601; 1900, 42,728; 1905 (local est.), 52,000. Consult: S. A. Lane, *Fifty Years and Over of Akron and Summit County* (Akron, 1892).

AKSAKOFF, ȧk-sä′kôf, Ivan Sergeyevich (1823-86). A Russian writer and leader of the Panslavists, born in the Government of Ufa. He studied in the school of jurisprudence and graduated in 1842, afterward entering the Moscow division of the Senate. In 1848 he entered the service of the ministry of the interior, as a "specially commissioned officer." He left this service in 1852 for journalistic work, becoming editor of the Moscow *Sbornik* (Miscellany), which was suppressed, the editor being put under special surveillance and forbidden ever to be the editor of a paper again. He was commissioned by the Geographical Society to study the fairs of Ukrayna, and his report received the medal of the Geographical Society, the Academy of Science also recognizing its value by awarding to its author one-half of the Demidoff prize. In 1855-56 he was in Bessarabia in command of the Serpukhoff detachment of the Moscow levy during the Crimean War. He established the *Den*, a weekly paper published from 1861 to 1865, and the *Moskva*, a daily paper, which was established in 1867. This latter sheet was suppressed three times by the Government within twenty-two months, these suppressions aggregating thirteen months of that period. During its suppression, the *Moskvich* was published in its place, ostensibly under another editor. Aksakoff was the leader of the Panslavist party in Russia, and, as a chairman of the Slavic Philanthropic Society, worked incessantly in the interest of a united state of all the Slavic nations. During the Russo-Turkish War he became the recognized leader of all those influences that brought about the War of Liberation of the Balkan Slavs, and his speeches in support of this cause had a world-wide circulation. On July 4, 1878, during a session of the Slavic Philanthropic Society, he made an impassioned speech, in which he arraigned the Russian diplomats, charging them with vacillation and treacherous submission in the presence of the other members of the Berlin Congress there sitting. He called upon the Emperor to fulfill his promises of "carrying this sacred undertaking to its very end," and demanded the rescue "of Russian glory, honor, and conscience that were being buried at the Congress." The Moscow Slavic Committee was suppressed, and Aksakoff was banished from Moscow, but was permitted to return in December of that year. From 1880 until his death he published the weekly *Rus* in the interests of the Slavophil party. In December, 1885, he made a bitter attack on Russian diplomacy in Bulgaria, with the result that an official reprimand was issued against his paper for "discussing current events in a tone inconsistent with true patriotism." Aksakoff replied in an even more pointed article, in which he defined true patriotism. He took the rebuke very much to heart, however, and his death on February 8, 1886, is supposed to have been hastened by the effect which the reprimand produced upon him. He was the best known poet of the Slavophil cause. His complete works were published posthumously.

AKSAKOFF, Sergei Timofeyevitch (1791-1859). A Russian writer, born in the Government of Ufa. He was educated at the University of Kazan, and held office on the legislative commission at St. Petersburg from 1807 to 1812. His works include the serio-humorous *Observations on Angling* (1847), *Memoirs of a Huntsman in the Government of Orenburg* (1852), with their continuation, *Tales and Memories of a Huntsman* (1855), and *The Family Chronicle* (1856), by some considered his best work, of which a second part appeared as *Bogrov's Childhood* (1858). A selection from his shorter writings was published in 1858.

AKSHEHR, äk′shĕhr (Turk. White Town, ancient Gk. *Φιλομήλιον*, *Philomēlion*). A city in the Turkish vilayet of Konieh, Asia Minor, situated on the Scutari-Konieh line, south of the Lake of Akshehr (Map: Turkey in Asia, D 3). It lies at the foot of the Sultan-Dagh in a fruitful and well-watered region, and has a considerable trade and manufactories of carpet. Pop., about 15,000.

AKSU, ȧk-so͞o′. A town of Eastern Turkestan. It is situated in 41° 7′ N. lat. and 81° E. long., 260 miles northeast of Yarkand, west of the River Aksu, at an altitude of over 3000 feet (Map: Asia, H 4). It is surrounded by a strong wall and is of considerable strategic importance. It is a meeting place for the caravans from Russia, China, West Turkestan, Kashmir, and India. The inhabitants are engaged chiefly in the manufacture of metal ware, cotton goods, and harness. In 1718 Aksu was nearly destroyed by an earthquake. In 1867 it was taken by the Khan of Kashgar, but was recaptured by the Chinese in 1877. Its population is over 50,000.

AKYAB, ȧk-yäb′. A town of Burma, India. The chief seaport of the district of Akyab or Arakan proper, and the capital of the province of Arakan (Map: Asia, J 7). It is situated on the eastern side of the island of Akyab, at the mouth of the Kuladan River, in lat. 20° 7′ N., 190 miles southeast of Calcutta. The houses are well built, the streets broad and regular, and it has a fine and well-protected harbor. Its chief article of export is rice. The United States is represented by a consular agent. Its rise from a fishing village dates from its choice as a port and the capital of the province in 1826. Pop., 1901, 35,680.

AL, äl. The article in the Arabic language. The pronunciation of the initial vowel is vague, so that the article vacillates between *al* and *el*. Before dentals, sibilants, and liquids, the *l* sound is assimilated to the following consonant, so that, e.g., *el-shams* (the sun) becomes *esh-shams;* and again, the initial vowel is frequently elided, when the word preceding the vowel ends in a vowel, e.g., *Abu-l-Feda* for *Abu-al-Feda.* The essential element of the article is the *l*, which belongs to the category of natural sounds having a demonstrative force. The Arabic article appears in such English words as algebra, alchemy, alcove, and Alhambra, which are directly derived from the Arabic.

ALABAMA. A river formed by the junction of the Coosa and Tallapoosa rivers, about 10 miles north of Montgomery, Ala. (Map: Alabama, B 4). Its general course is westward to Selma, thence south-westward to about 50 miles north of Mobile, where it meets the Tombigbee, and with that stream forms the Mobile River. It is 320 miles long, and navigable from its mouth to Montgomery, nearly its entire length.

ALABAMA, ăl′ȧ-bä′mȧ, known as the "Cotton State." One of the Gulf States of the American Union, situated between lat. 30° 10′ and 35° N., long. 84° 53′ and 88° 30′ W. It is bounded on the north by Tennessee, on the east by Georgia, on the south by Florida and the Gulf of Mexico, on the west by Mississippi; length, about 336 miles from north to south; average width, 175 miles; total area, 51,998 square miles, of which 719 square miles is water (Map: United States, J 4). Alabama, by the revised areas of 1906, ranks as the eighteenth State in the Union in population, the twenty-seventh in size, and ninth in order of admission.

Topography. The southern extremity of the Appalachian mountain system extends into the State from northern Georgia in a series of low parallel ranges. Of these, Raccoon and Lookout mountains are the most prominent, but do not attain any great elevation. They are flat-topped ridges, about 1600 feet in elevation at the Georgia line, gradually lowering to the westward, the Raccoon Mountains extending in a very low range (called Sand Mountains) well across the State, while the Lookout Mountains terminate abruptly after reaching a distance of about 60 miles within the State. To the southeast of these ranges lies the comparatively level Piedmont region. To the southwest, at the very terminus of the mountain system, is the low-lying Cumberland plateau—the coal-fields of Alabama. On the north of all these are the lower lands of the Tennessee valley. The whole region just described includes the northeast two-fifths of the State. The remainder, the southwest three-fifths of the State, constitutes the coastal plain, which slopes gradually from an elevation of about 600 feet to sea level.

Climate and Soil. Excepting in the lowland along the rivers, the climate is very healthful, particularly in the north. Extremes of temperature are rare, the mean temperature for January being 42.9° and for July 83.9°. The summer heat is tempered by winds from the gulf. Snow falls occasionally in January and February, but rarely in the south; the frost limits at Montgomery are October 10 and April 25. The prevailing winds for the whole year are from the south and southwest.

The average temperature and rainfall in the north are 59.70° and 54 inches respectively, gradually increasing to 66.60° and 63 inches in the south.

The valley of the Tennessee has chiefly a deep red calcareous soil, utilized for the cultivation of cereals; that in the metamorphic region is a red or gray loam with clay subsoil; in the coal regions it is sandy, with sand or clay subsoil; the north or middle divisions are bordered by a wide belt of red or yellow loam over stratified rocks and pebbles, and are heavily wooded; the cotton belt has a heavy black calcareous soil from two to twenty feet deep, forming a portion of the so-called "black belt" of the Southern States. South of this, brown and red clay loams predominate. In the extreme southern counties the soil is light and sandy. Swamp land occupies considerable areas in various parts of the State.

Geology. The stratified rocks represent every formation occurring in the Appalachian region. There are three geological divisions of Alabama, namely: The northern, containing most of the State north and west of a line from the northeast corner of the State through Birmingham nearly to Tuscaloosa, and including the great Tennessee valley, in which the rock masses belong to the Sub-carboniferous lime-stones and the Coal measures; their strata are approximately horizontal. Adjoining this on the east is the middle region, bounded by a line drawn from Tuscaloosa through Centreville, Clanton, and Wetumpka to Columbus, Ga. This includes (1) the metamorphic region, with altered and crystalline sediments of Silurian or preceding ages—quartzites, marbles, granites, and gneisses; the strata in many places disintegrated into masses of stratified clay and interlaminated with quartz seams. (2) The Coosa valley, with prevailing calcareous rocks. (3) The Coosa and Cahaba coal fields, their strata consisting of sandstones, conglomerates, shales, and coal beds, tilted and unequally de-graded. This division contains some of the highest land in the State. The southern division, south and west of these limits, including the cotton belts, consists largely of drift deposits irregularly stratified over the eroded surface of Cretaceous and Tertiary rocks. Clark County, between the Alabama and Tombigbee, is rich in fossil remains of Cretaceous and Tertiary age.

Mineral Resources. The southern limit of the mineral region may be indicated by a line passing through Pikeville, Tuscaloosa, and Wetumpka to Columbus, Ga. Within this area are the comparatively insignificant gold deposits of Randolph County, and three fields of bituminous coal over 8660 square miles in extent, named from the rivers that drain them—the Warrior, the Cahaba, and the Coosa. Cannel, free-burning, lump, coking, gas, and other coals of superior quality are found. There are extensive beds of iron ore, including red hematite, limonite, black-band, drift, magnetic, and specular; and the Choccolocco, Anniston, Coosa, Cahaba, Birmingham, and other valleys are noted for the abundance of their iron ore. Among other mineral products are asbestos, asphalt, copper, corundum, emery, fire-clay, graphite, granite, lithographic stone, manganese, white and variegated marble, marl, red ochre, phosphates, bauxite, pottery and porcelain clays, salt (in the southwest), slate, soapstone, and small amounts of silver and tin. Natural gas has also been discovered, but the supply is inconsiderable.

Mining.—It is not until recent years that the great mineral resources of the State have been extensively exploited. This recent growth of the mining industry has been largely responsible for the quickening of the general industrial life of the State, and the creation of a most optimistic spirit concerning her future industrial progress. Coal and iron are the leading minerals, and the immediate proximity of these constitutes an advantage not enjoyed in the more extensively developed iron mining districts of Lake Superior. The industry has attained its greatest development in the Birmingham region. The value of bituminous coal mined in the State rose from $2,500,000 in 1886 to $10,000,000 in 1900 and $14,875,000 in 1905. This gave the State fifth rank both in the amount and in the value of the output. A large portion of the coal is used in the manufacture of coke, in which the State takes second rank. (See MANUFACTURES.) The growth of iron mining has been no less striking. In 1880 there were 171,000 long tons mined; in 1889, 1,570,000 tons; and in 1905, 4,257,000 tons, ranking the State next to Minnesota and Michigan in importance. Seventy-eight per cent. of the product is red hematite, 21 per cent. brown hematite, and the remainder, magnetite. Alabama ranks first in the production of brown hematite. The value of the output of pig-iron in 1905 was $22,680,000. Limestone is quarried extensively, and most of it is burned into lime or used as a flux. Bauxite is mined in Cherokee County, its annual production being about 10,000 long tons, and graphite in Cleburne County. Building clays, sandstone and mineral springs are each of some commercial value.

FISHERIES. Owing to the limited coast line of the State, its sea fisheries are of less importance than those of the other Gulf States. The industry gives employment to about a thousand men, and the value of the product is placed at about $260,000.

AGRICULTURE. Agriculture is the leading industry of the State, but it is not keeping pace with the other rapidly developing industries or with the increase of population. Agriculture received a decided setback from the Civil War, and has not yet completely adjusted itself to the new industrial régime. The acreage of farm land and the percentage of improved land (about 40 per cent.) are but little larger than they were in 1860, while the valuation of farm land and the amount and value of almost every kind of farm property and produce is less than it was in 1860. The old plantation system of large farms, whose cultivation was carried on under the direction of the owner, has given way to a system of small rented farms. The average size of farms, which was 347 acres in 1860, has decreased to about 92 acres, and the rented farms constitute over half of the entire number—both methods of renting, that for a fixed money payment and that for a share of the product, being equally in vogue. The farm land is still held by a comparatively few individuals, a considerable proportion of whom are representative of the merchant class. The holdings are divided into convenient portions, and the negro renter receives a meagre supply of farm equipments, upon which, as also upon the prospective crop, the merchant holds a lien. The negro becomes the customer of the merchant and can seldom catch up with his obligations. The merchant finds his rent most certain and his sale of provisions greatest when the renter confines himself largely to the cultivation of cotton, which he willingly does, and thus cotton remains king. The continuous planting of this crop before the war, as well as since that time, has resulted in the exhaustion of a naturally fertile soil. While cotton is grown in most parts of the State, much the greater portion is raised in the "cotton belt," a narrow strip of black prairie land extending east and west across the State in the latitude of Montgomery. Alabama usually ranks fourth in the value of her cotton product. Corn is next in importance, and its acreage is almost equal to that of cotton, but the product is of much less value. Oats are the only crop that has experienced a noteworthy increase in cultivation since 1860, an increase about commensurate with the decrease in the cultivation of wheat, though the cultivation of the latter greatly increased between 1890 and 1900. These and small quantities of other cereals are grown most extensively in the "cereal belt," or the valley of the Tennessee River in the northern part of the State. This valley is also very favorable for the raising of apples and other fruits, the mountains on either side giving protection from the heat of the south and the winds of the north. Peanuts are raised in the southeast. The State takes a high rank in the production of peaches as well as melons. Cowpease, sweet potatoes, and sugar cane are extensively grown throughout the State. Most of the sugar cane in recent years is manufactured into molasses. There is much barren waste land in the mountain regions of the north, while forests still cover the greater portion of the southern end of the State. Cotton being the predominant crop, the conditions are not favorable for the extensive raising of stock. Such as is raised goes to supply the local needs. The following tables indicate the trend of the agricultural industry:

	Horses.	Mules and Asses.	Milch Cows.	Other Cattle.	Swine.	Sheep.
1900	133,500	132,300	231,800	279,000	1,866,000	171,800
1906	155,000	186,000	253,000	497,000	1,137,000	190,000

	Corn. (Bushels.)	Oats. (Bushels.)	Wheat. (Bushels.)	Cotton. (Bales.)	Potatoes, Irish. (Bushels.)	Hay. (Tons.)
1900	29,300,000	4,300,000	916,000	1,061,000	588,000	94,000
1906	47,849,302	3,167,879	1,085,029	1,252,000	694,350	100,882

There is to-day evidence of a growing sentiment in favor of diversified farming and an increasing tendency toward the raising of pease, alfalfa, and other leguminous plants which are of special value to the soil, and there is in general a more hopeful view of the agricultural future, and a belief that it is sharing in the general industrial awakening of the South.

MANUFACTURES. Recent years have clearly demonstrated that Alabama possesses a combination of advantages for manufacturing enterprise such as are scarcely found in any other part of the country, and which promise to place her in the front rank of manufacturing States. The raw material and the auxiliary agencies of manufacture are found in close proximity. In the north iron ore is found in the same locality with coal, limestone, and dolomite, making possible a minimum cost of production for iron and its manufactures. The immense forests of the South supply material for the lumber industry, and the production of tar, turpentine, and resin. The numerous waterfalls and rapids in the State supply the needed power for turning the cotton crop into the manufactured product, though the abundance and cheapness of coal has much retarded the utilization of this power. With these advantages must also be considered the lesser cost of living in the South, thus making a lower wage possible. The comparative scarcity of strikes and the absence of labor legislation and prohibition of child labor in the State have served as an additional attraction for capital from the North. The greatest and almost the sole obstacle in the way of manufacturing, especially of iron products, has been the high railway freight rates, which make it difficult to complete with the products of the North. Establishments classed as factories employed in 1900, 52,711 wage-earners, and showed products valued at $72,109,929, while in 1905 their wage-earners numbered 62,173, and their products were valued at $109,169,922. The following table of the eleven leading industries shows a remarkable development from 1900 to 1905 in nearly every industry. The iron and steel industry leads. Steel manufacture in Alabama is of recent origin. About two-thirds of the total value in 1905 was represented by pig iron, in the production of which Alabama ranked fourth in both 1900 and 1905. Alabama iron ores are not suited to the manufacture of steel by the Bessemer process, and it was not until the recently manifested preference for steel manufactured by the open hearth process that profitable manufacture of steel in Alabama was possible. Of the foundry and machine shop products, cast-iron pipe is the most important, the other leading products being stoves, car wheels, boilers, and engines. The value of products for this industry was more than four times as great in 1905 as in 1890, its development being stimulated by the rapid growth of the iron and steel industry. For a like reason there was a great increase in the manufacture of coke, Alabama ranking second in its production in 1905, with an output of 2,335,613 tons, or 10 per cent. of the total for the United States. The manufacture of cotton goods now ranks next to the steel industry in importance. While the State was behind some of her sister States in developing cotton manufactures, the fact that the value of products quadrupled from 1890 to 1900 and doubled from 1900 to 1905 leaves no doubt of the future prominence of the State in the production of cotton goods. Owing to the elimination of certain duplications in estimating the value of lumber and timber products, the value for 1905 in the table following should be increased by $4,217,648, in order to make it comparable with the corresponding table for 1900. The yellow pine is the chief lumber product, and it furnished 85 per cent. of the total value of lumber and timber products in 1905. Fertilizers are produced by a process of combining Alabama cottonseed meal with phosphates which are obtained from Florida mines. The following table, which is a compilation for eleven leading industries of the State, is self-explanatory:

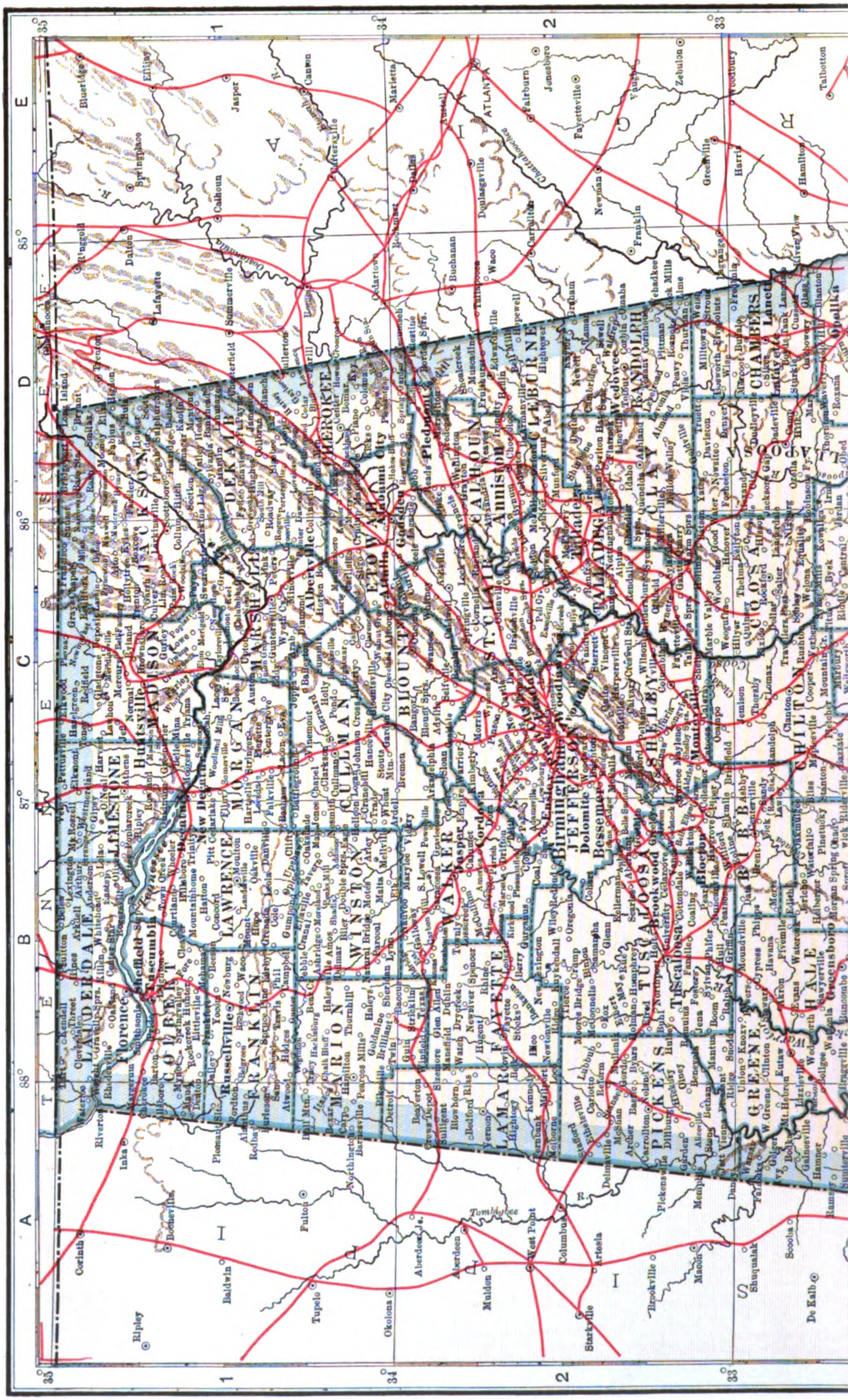
COMPARATIVE SUMMARY OF ELEVEN LEADING INDUSTRIES

INDUSTRY	Census	Number of Establishments	WAGE-EARNERS Average Number	Value of Products including custom work and repairing
Total for selected industries for state	1905	1,312	54,073	$93,953,829
	1900	1,403	45,248	60,459,793
Increase, 1900 to 1905	......	91 *	8,825	33,494,036
Per cent. of increase	.....	6.5 *	19.5	55.4
Per cent. of total of all manufacturing industries in state	1905	69.7	87.0	86.1
	1900	70.2	85.8	83.8
Cars and general shop construction and repairs by steam railroad companies	1905	16	5,501	6,681,074
	1900	19	4,030	4,172,192
Coke	1905	24	2,165	6,175,126
	1900	15	1,592	3,726,433
Cotton goods	1905	46	11,480	16,760,332
	1900	31	8,332	8,153,136
Fertilizers	1905	19	551	2,341,132
	1900	17	439	2,068,162
Foundry and machine shop products	1905	78	4,764	9,122,874
	1900	74	3,461	5,482,441
Iron and steel	1905	29	8,590	24,687,359
	1900	25	7,238	17,392,483
Lumber and timber products	1905	590	14,682	15,939,814
	1900	796	14,450	12,522,423
Lumber, planing mill products, including sash, doors, and blinds	1905	67	1,106	2,095,968
	1900	50	432	763,125
Oil, cottonseed, and cake	1905	58	1,400	5,769,061
	1900	28	759	2,985,890
Printing and publishing	1905	241	915	1,946,724
	1900	196	799	1,159,803
Turpentine and rosin	1905	144	2,919	2,434,365
	1900	152	3,716	2,033,705

* Decrease.

TRANSPORTATION AND COMMERCE. The Alabama and Tombigbee rivers, with their more important tributaries, and the Chattahoochee River on the east boundary, offer excellent facilities for navigation. Railroad construction was very slow in developing, but has made a steady increase in recent years, in marked contrast with most Northern States. The mileage in 1880 amounted to 1843 miles, but increased to 4197 in 1900, and to 4752 in 1906. There were 9.14 miles for every 100 square miles of territory, and 25.60 miles for every 10,000 inhabitants. Almost every trunk line of the South passes through Birmingham. There is a State Railroad Commission, which fixes rates, but railroads are not bound to adopt them. In case of damage suits, however, the rates fixed by the commission are *primâ facie* reasonable. Mobile is the only seaport, and the chief exports are cotton, breadstuffs, provisions, and lumber. Savannah takes the bulk of the cotton for export and coastwise shipment, and Pensacola the lumber.

BANKS. On September 4, 1906, there were seventy-four national banks in operation in the State. The capital stock amounted to $7,666,000; circulation outstanding, $5,587,000; deposits, $25,166,000; and surplus, $2,364,000. On October 10, 1906, the 160 State banks had capital stock amounting to $7,533,000. The deposits were $26,368,000, and their loans and discounts amounted to $29,616,000.


35°
34°
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1
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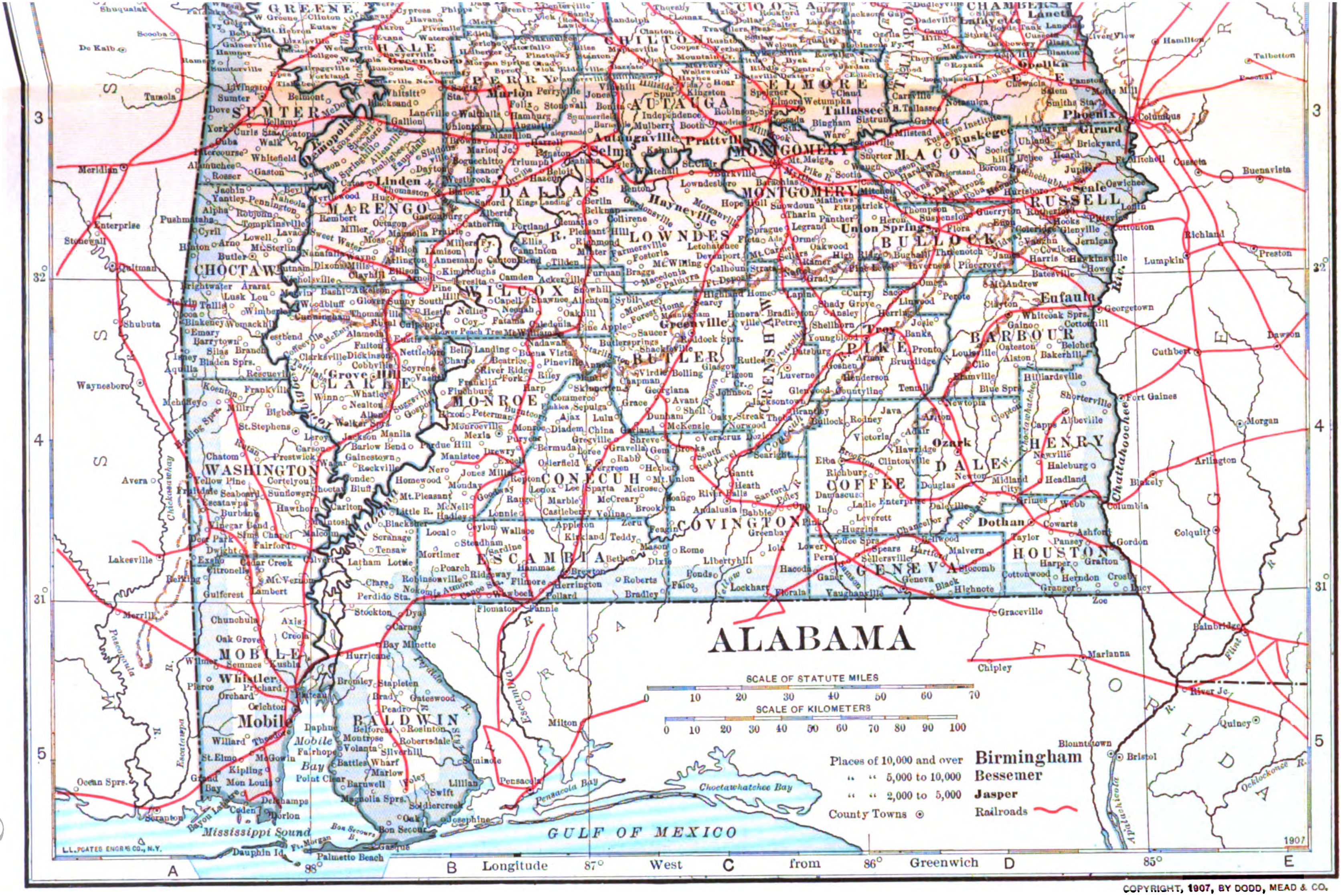
TENNESSEE
GEORGIA
MISSISSIPPI
LAUDERDALE
LIMESTONE
MADISON
JACKSON
DEKALB
CHEROKEE
COLBERT
FRANKLIN
LAWRENCE
MORGAN
MARSHALL
ETOWAH
CALHOUN
CLEBURNE
MARION
WINSTON
CULLMAN
BLOUNT
ST. CLAIR
TALLADEGA
CLAY
RANDOLPH
LAMAR
FAYETTE
WALKER
JEFFERSON
SHELBY
COOSA
CHAMBERS
PICKENS
TUSCALOOSA
BIBB
CHILTON
GREENE
HALE
Florence
Sheffield
Tuscumbia
Huntsville
New Decatur
Decatur
Birmingham
Bessemer
Gadsden
Anniston
Tuscaloosa
Greensboro
Atlanta
Marietta
Rome
Dalton
Corinth
Tupelo
Columbus
West Point
Starkville
Aberdeen
Okolona
Tombigbee
Chattahoochee



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Finance. In 1906 the finances were in the best condition reached since the Civil War. The bonded debt of $9,057,000, created during the "carpet-bag" régime, constitutes one of the taxpayer's heaviest burdens. Almost all of the debt was refunded July 1, 1906, and the interest charge considerably reduced. No provision is made for the final extinction of the debt. New debts can be incurred only for purposes of repelling an invasion or suppressing an insurrection. The valuation of property in this State has increased steadily from $139,000,000 in 1880 to $383,420,000 in 1906. The amount of the general tax decreased from a maximum of $2,164,930 in 1901 to $786,890 in 1906, the decrease being mainly due to the lowering of the general purpose tax rate in 1903 from five and one-half mills to two and one-half mills. The special school tax rate is three mills. The receipts for 1906 amounted to $3,776,500, this being an increase of $1,120,000 over the receipts for 1900. The principal items of revenue were: General taxes, 20 per cent.; licenses, about 10 per cent.; pension fund taxes, 9 per cent.; special school tax, 26 per cent.; earnings of convicts, 20 per cent. Of the disbursements ($3,365,350), 38 per cent. was for education, 23 per cent. for charities and corrections, and 13.2 per cent. each for pensions and interest. The balance October 1, 1906, was $1,826,326.

Education. Education in Alabama is in a very unsatisfactory but hopeful condition. The percentage of her illiteracy is exceeded in but three other States. There are great difficulties in the way of maintaining satisfactory educational standards, such difficulties as are incident to the breakdown of an industrial system and the presence of a large ex-slave class. The schools have lacked financial support, as there has been no legal provision for local taxation for educational purposes. The new constitution, however, provides a special State tax for school purposes and for county school taxes. Many of the teachers lack proper qualifications (especially the colored teachers), although the present laws make it possible to secure better qualified teachers. The schools are not graded. The length of the school term is commonly less than one hundred days per year; but in the white schools the teachers are often retained for longer terms, at the expense of the parents of the school children. Of late, however, public interest in the matter has been aroused. In 1906 the school population was 672,210, the white children numbering 384,977 and the colored, 287,233. The number enrolled in the public schools was 376,106, or somewhat over 55 per cent. of the school population. Of the total enrollment, 230,005 were white and 146,101 colored. There were 5966 teachers employed, of whom 4412 were white and 1554 colored. The amount expended for teachers' salaries, including county superintendents, aggregated $1,020,467, white teachers receiving an average monthly salary of $41.73 and colored teachers $24.04. The State supports, together with the aid of the Peabody Fund, normal schools at Florence, Jacksonville, Troy, Livingston, Montgomery, Tuskegee, and Normal, the last three being for colored students. A district system of agricultural schools has been established by the State, comprising nine district schools. The State also supports a university at Tuscaloosa, an Agricultural and Mechanical College (colored) at Normal, a Polytechnic Institute at Auburn, a Girls' Industrial School (white) at Montevallo, and a Boys' Industrial School at East Lake. Private institutions of learning are as follows: St. Bernard College, Cullman; Howard College, East Lake; Southern University, Greensboro; Lafayette College, Lafayette; Spring Hill College, Spring Hill, and eight colleges for women. The Tuskegee Normal and Industrial Institute (colored) at Tuskegee (q.v.) has become famous under the administration of Booker T. Washington for the efficient way in which it is helping to solve the race question.

Charitable and Penal. The State institutions comprise the Institution for the Deaf, Dumb and Blind, at Talladega; hospitals for the insane, at Tuscaloosa and Mount Vernon; a penitentiary, at Wetumpka; and nineteen branch prisons, where State convicts are kept. The State owns cotton farms and a cotton mill, where labor is performed by boys and women convicted of offenses by the courts. The convict system has undergone radical improvements, but prisoners are still leased to contractors. The receipts in the convict fund in 1906 were $759,494; expenditures, $433,489.

Religion. As in other portions of the South, the Baptists and the Methodists have the field almost to themselves. The strongest of the other denominations are the Presbyterian, Catholic, Christian, and Episcopalian.

Population. The population of the State by decades was as follows: 1820, 127,901; 1830, 309,527; 1840, 590,756; 1850, 771,623; 1860, 964,201; 1870, 996,992; 1880, 1,262,505; 1890, 1,513,017; 1900, 1,828,697. Her rank rose from nineteenth in 1820 to twelfth in 1840; since 1860 it has been gradually falling back, being eighteenth in 1900. The population increased 20.9 per cent. for the last decade, or at a ratio almost identical with that of the nation. The number of inhabitants per square mile in 1900 was 35.5, as against 25.6 for the whole country. In common with the other Southern States, the population is almost entirely native born, the foreign born never having exceeded 15,000 for the whole State. The negroes in 1900 numbered 827,000. They are centred largely in the cotton belt, where in certain counties they outnumber the whites five to one, while this ratio is just reversed in a number of counties north and south of this belt. Owing to the relative importance of agriculture, the population is largely rural, but 10 per cent. of the total living in cities of 4000 population and over in 1900. With the development of mining and manufacturing the urban element has rapidly increased, the number of places containing a population of more than 4000 having risen from ten in 1890 to sixteen in 1900. While the negroes engage but little in these occupations, they yet show a strong inclination to gravitate to the urban centres. For population of the State by counties in 1900, see back of map. In 1905 the population of the State was estimated at 1,986,347.

Cities. The largest cities in 1900 were: Mobile, 38,469; Birmingham, 38,415; and Montgomery, 30,346. A special census in 1903 gave Birmingham 42,087, Mobile 40,686, and Montgomery 32,884.

Government. The present Constitution was adopted by a vote of the people in November, 1901. The right of suffrage is restricted to those who have resided two years in the State, one year in the county, and three months in the precinct or ward, and have paid the required poll tax and registered. In order to register prior to December 20, 1902, the applicant must have engaged in, or been a descendant of, one who has participated in one of the following events: the War of 1812, the Mexican War, any war with the Indians, the war between the States, the war with Spain, or served with the forces of the Confederate States or of the State of Alabama in the war between the States; and he must be an individual of good character, and who understands the duties and obligations of citizenship under a republican form of government. After January 1, 1903, the qualifications for citizenship are to be modified, and from that date the ability to read and write any clause of the United States Constitution in English, and the pursuit of some lawful calling for the greater part of the twelve months preceding the time of registration, will be prerequisites for voting. These qualifications are not required of those who own, individually or through their wives, a certain amount of property free from tax incumbrances. Any person guilty of a criminal offense, including the selling, buying, or offering to sell or buy, a vote, is debarred from voting. The constitution contains a detailed statement of the proper procedure in registration, of penalties, etc. Each county is to have a board of registrars, consisting of three members, who issue life certificates to those who are entitled to them. An amendment to the constitution may be secured by a three-fifths vote of each house, ratified by a vote of the people. A constitutional convention may be called when voted by a majority of each house, and ratified by the people, and the power of such convention in altering, revising, or amending the constitution is subject to no restrictions.

Legislative.—The legislative body consists of a Senate and a House of Representatives, the maximum limit of membership being 35 and 105 respectively. The number of senators must not be more than one-third nor less than one-fourth that of representatives. Senatorial districts are composed of contiguous undivided counties. Elections are held the first Tuesday after the first Monday in November of every fourth year, and the legislature meets on the second Tuesday in the following January, the session being limited to fifty days. Members are paid $4 per day and traveling expenses. Revenue bills originate in the House, and cannot be passed in the last five days of the session. The legislature must provide for the revision of the statutes every twelfth year. One of the numerous legislative prohibitions prevents the State from engaging in or aiding in internal improvements.

Executive.—A governor, lieutenant-governor, attorney-general, State auditor, secretary of State, State treasurer, superintendent of education, and commissioner of agriculture and industries are elected every fourth year, at the time and place appointed for the election of members of the legislature. None of these officers is eligible for reëlection, and the governor is not eligible to election or appointment to any office in the State, or to the Senate of the United States, during his term or within one year after the expiration thereof. The lieutenant-governor is ex-officio president of the Senate, and succeeds to the office of governor in case that office becomes vacant. The attorney-general, Secretary of State, and State auditor constitute a board of pardons, to hear petitions for pardons, commutation, or parole in cases of felony, and advise the governor thereon; but the decision of the governor does not need to conform with that of the board. The governor may veto any bill, or any item of an appropriation bill; but a majority vote of each house may override the veto of the governor. A bill becomes law if the governor fails to pass upon it within one week after it has been submitted to him.

Judiciary.—The judicial power of the State is vested in the Senate, sitting as a court of impeachment, a supreme court, circuit courts, chancery courts, courts of probate, such courts of law and equity inferior to the supreme court, consisting of not more than five members, as the legislature from time to time may establish, and such persons as may be by law invested with powers of a judicial nature. A circuit court, or a court having the jurisdiction of a circuit court, is held in each county of the State at least twice every year. The State is divided into chancery divisions, with a chancellor for each division. The divisions are subdivided into districts, in each of which the chancellor holds court at least twice each year. The legislature may establish courts of probate in each county. Judges of the supreme, circuit, chancery, and probate courts are elected for a term of six years. For each judicial circuit a solicitor (prosecutor) is elected for a term of four years. Each precinct has two justices of the peace and one constable, excepting precincts lying within towns of over 1500 inhabitants, in which precincts the legislature may establish inferior courts in lieu of the justices of the peace.

Local Government.—Both county and municipal corporations are limited in their taxing and debt incurring powers. Each county elects a sheriff, who serves for a term of four years, but he cannot be reëlected. One year's residence is necessary to secure a divorce, the principal causes for which are desertion (two years) and habitual drunkenness.

The State has eleven votes in the Electoral College. Montgomery is the capital.

Militia.—The organized militia of Alabama, officially known as the National Guard, consists (1905) of 2297 men. The census of 1900 found 328,000 males of militia age, of whom 165,000 are liable to military duty. The National Guard is formed into one brigade, and consists of three regiments of infantry, two of twelve companies each and one of nine companies; one separate company; one battalion of artillery, composed of four batteries; one squadron of cavalry, composed of four troops.

HISTORY. In 1540 De Soto passed through the territory now included in Alabama, and found it occupied by powerful Indian nations. Among them were the Alibamas, who gave their name to the country; the Chickasaws, the Choctaws, and the Creeks, together constituting the Muskhogean family; the Cherokees and Apalaches. Alabama was included under Carolina in the royal grants made by the Stuarts in 1629 and 1663, but no attempts at settlement were made by the English. In 1702, the French, under Bienville, removed from Biloxi Bay, where a fort had been built some years previous, and erected Fort St. Louis, on Mobile Bay. Mobile was founded in 1711, and until 1720 was the capital of Louisiana. In 1714 Fort Toulouse was built at the junction of the Coosa and Tallapoosa. The growth of the colony was hindered by disease and poverty;

the Chickasaws remained hostile, and the English planted their trading posts in the wilderness north of Mobile. When France ceded her possessions east of the Mississippi to England, in 1763, Alabama, north of 32° 40′, was added to the Illinois territory, and the part south of the line to West Florida. During the Revolution, West Florida, which had by that time gained English and Scotch settlers, remained loyal, and in 1779-80 Spain took advantage of her own war with Great Britain to seize the province. After 1783, the United States, as the successor of England, claimed as far south as the thirty-first degree, but Spain continued to hold the territory south of 32° 40′ till 1798. Georgia claimed between 31° and 35° to the Mississippi, but sold her rights in 1802. In 1798 Congress organized the region included between the Mississippi River on the west, the Chattahoochee on the east, the 31st parallel on the south, and a line drawn from the mouth of the Yazoo into Mississippi Territory, and in 1804 extended its northern boundary to Tennessee; in April, 1813, the Mobile district was taken from the Spanish by the United States and annexed to Mississippi Territory.

Incited by the British, the Creeks and their allied tribes rose in 1812 against the whites, their atrocities culminating in the great massacre at Fort Mims, on the Alabama River, August 30, 1813. General Jackson headed the forces sent against the Indians, and by his victories at Talladega and the Horse Shoe Bend of the Tallapoosa, 1813-14, forced them to surrender their territory west of the Coosa and south of Wetumpka. In a number of subsequent treaties the Indians gradually abandoned the larger portion of their land, until, between 1830 and 1836, they were removed in a body west of the Mississippi River. (See CREEKS.) Mississippi was set off March 1, 1817, and on March 3 was formed the territory of Alabama, with its seat at St. Stephens. The first legislature met at Huntsville, January 19, 1818, and the State was admitted to the Union December 14, 1819. In 1820 the seat of government was removed to Cahaba, in 1826 to Tuscaloosa, and in 1847 to Montgomery. The people of Alabama were aggressive champions of territorial expansion for slavery purposes, and took a prominent part in the Mexican War. They entered very zealously into the secession movement, and early in December, 1860, urged the Southern States to withdraw from the Union. At Montgomery, on January 11, 1861, an ordinance of secession was passed by a vote of 61 to 39—the minority representing the northern part of the State, where the Whig party had been especially strong. Forts Gaines and Morgan, at the entrance to Mobile Bay, were seized, and on January 21 the senators and representatives withdrew from Congress. Delegates from the seceded States met at Montgomery, February 4, and organized the Confederate Government. A Confederate arsenal, foundry, and navy yard were soon established at Selma. In February and April of 1862 Federal troops occupied the Tennessee Valley. In August, 1864, Farragut destroyed a Confederate fleet in Mobile Bay, and, aided by General Granger with a land force, reduced Forts Gaines and Morgan. In April, 1865, the Union forces took Selma, Tuscaloosa, Montgomery, and Mobile. A provisional government was established June 21, 1865, and a convention repealed the act of secession and altered the constitution. State officers and members of Congress were chosen; but Congress, in conflict with President Johnson, refused admission to the representatives from Alabama. By the reconstruction act of March 2, 1867, Alabama was included with Georgia and Florida in the third military district, under General Pope. In November a new constitution was framed, which received, February, 1868, 70,182 votes out of 71,817 cast, and though the majority of registered voters had remained away from the polls, Congress declared the constitution operative, and it continued in force till 1875, when a new constitution was adopted. On July 14, 1868, military rule ceased, and on November 16, 1870, the State ratified the fifteenth amendment to the Federal constitution. For a decade after the Civil War, Alabama suffered from maladministration. Party spirit ran very high, and elections were bitterly contested. The dishonesty of officials and the extravagant railway policy they pursued brought the State and the chief towns into serious financial difficulties. With the reorganization of the public debt in 1876 began an era of quiet and prosperity. Cotton and steel manufactures, lumbering, and the mining industries thrived enormously, and many large towns sprang up in the northern part of the State. Agricultural interests, by comparison, showed little growth. Educational progress did not keep up with economic development until the end of the Nineteenth Century. Since 1874 Alabama has been invariably Democratic. In 1901 a constitutional convention was busy with the problem of changing the organic law in such a manner as to insure political supremacy to the white population.

The following is a list of the governors of the State, and the parties to which they belonged:

TERRITORIAL GOVERNOR.

William W. Bibb	1817-19

STATE GOVERNORS.

W. W. Bibb	Democrat	1819-20
Thomas Bibb	“	1820-21
Israel Pickens	“	1821-25
John Murphy	“	1825-29
Gabriel Moore	“	1829-31
Samuel B. Moore	“	1831
John Gayle	“	1831-35
Clement C. Clay	“	1835-37
Hugh McVay	“	1837
Arthur P. Bagby	“	1837-41
Benjamin Fitzpatrick	“	1841-45
Joshua L. Martin	“	1845-47
Reuben Chapman	“	1847-49
Henry W. Collier	“	1849-53
John A. Winston	“	1853-57
Andrew B. Moore	“	1857-61
John G. Shorter	“	1861-63
Thomas H. Watts	“	1863-65
Lewis E. Parsons	Provisional	1865
Robert M. Patton	Republican	1865-67
Wager Swayne	(military governor)	1867-68
William H. Smith	Republican	1868-70
Robert B. Lindsay	Democrat	1870-72
David P. Lewis	Republican	1872-74
George S. Houston	Democrat	1874-78
Rufus W. Cobb	“	1878-82
Edward O'Neal	“	1882-86
Thomas Seay	“	1886-90
Thomas G. Jones	“	1890-94
William C. Oates	“	1894-96
Joseph F. Johnston	“	1896-1900
William J. Sanford	“	1900-04
William D. Jelks	“	1904-07
Braxton B. Comer	“	1907-

Bibliography. Brown, *School History of Alabama* (1900); Phillips, *Iron Making in Alabama* (Montgomery, 1898); Owen, *Bibliography of Alabama*, in 1898 *Annual Report of American Historical Association* (Washington, 1897); Clark, *History of Education in Alabama, 1702-1889* (Washington, 1889); Hillyard, *The New South* (Baltimore, 1887); Fleming, *Civil War and Reconstruction in Alabama* (New York, 1905).

ALABAMA CLAIMS. A series of claims for indemnity made upon Great Britain by the United States, based upon the alleged omission of Great Britain to observe the obligations imposed by international law upon neutral nations with reference to their dealings with, and duties to, belligerents. The claims, in most particulars, arose from damages inflicted by vessels in the Confederate service which had been fitted out or built in English waters and allowed to sail thence. The Declaration of Paris (q.v.), adopted in 1856 by most of the nations of Christendom, had abolished privateering, and, though the United States was not a party to the convention, this decree had become a recognized principle of international law. Moreover, both the United States and England had passed acts early in the century prohibiting the equipment of land or sea forces for the purpose of operating against the territory or commerce of a friendly nation, and making it the duty of the Government to prevent such filibustering (Act of Congress of April 20, 1818, 3 Stats. at Large, 448; Foreign Enlistment Act, 59 George III., cap. 69). It was upon these acts and principles affecting international relations, that the claims of the United States were founded.

The facts of the case were these: Following President Lincoln's call for volunteers, President Davis of the Confederate States offered letters of marque and reprisal (q.v.) to private vessels to prey upon the commerce of the United States. Prompt advantage was taken of this offer, and numerous privateers issued from southern ports to harry the New York and New England merchant marine. Meanwhile, Queen Victoria had issued her proclamation of neutrality, forbidding her subjects to take part with either side, and directing her official servants to accord belligerent rights to both parties to the struggle. Equipment was forbidden the vessels of both belligerents. Nothwithstanding this proclamation, and the repeated and urgent protests of the American minister, Charles Francis Adams, the sympathy of British officials, especially in the colonial ports, with the Southern cause was notorious, and harbors like Nassau in the West Indies became the refuge of Confederate cruisers.

The history of the *Alabama* is typical of the more flagrant cases submitted to the tribunal of arbitration. She was built at Birkenhead, England, under circumstances of great suspicion. The attention of the British Government was repeatedly called to the case, and finally some steps were taken by the authorities to detain the vessel; but "No. 290," as she was called, left port without register or clearance papers, July 29, 1862, and, taking on her equipment in the Azores from two English vessels, assumed the name *Alabama*, under which she became famous, and set out on her career of destruction. In much the same manner the *Florida, Georgia, Shenandoah*, and various other cruisers eluded the watchfulness of British officials. Before her destruction by the *Kearsarge*, June 19, 1864, the *Alabama* is said alone to have captured and destroyed seventy vessels of the United States.

The first phase of the controversy appeared in 1862, in the negotiations between the American minister, Mr. Charles Francis Adams, and Lord John Russell, with reference to the alleged violation of England's Foreign Enlistment Act by the *Alabama*, and the obligation of the English Government to detain her; and though the English Government manifested a different policy subsequent to the sailing of the *Alabama*, and prevented the sailing of ships which were equipped in violation of law, several ships which had come from English ports were nevertheless on the seas, and the total damage inflicted by them upon American shipping was enormous. The whole matter constituted the most important problem of diplomacy left as a result of the Civil War. As early as 1865, steps were taken to determine a method of adjustment; but it was not till 1871 that a basis for adjudication was agreed upon, in the important Treaty of Washington, May 8. By this treaty, it was stipulated that all claims known generically as the "Alabama claims" should be submitted to the decision of five arbitrators, one named by England, one by the United States, and one each by the King of Italy, the Emperor of Brazil, and the President of the Swiss Confederation. For the guidance of this court of arbitration, the Treaty of Washington laid down the important "three rules" defining the obligation of a neutral power to use "due diligence" to prevent the hostile use of its ports against a friendly nation. In accordance with this arrangement, the court met at Geneva, December 15, 1871. The chairman of the court was Count Federigo Sclopis, the arbitrator named by the King of Italy; and the other members were Baron d'Itajuba, Brazilian minister at Paris, Jacob Stæmpfli, for three terms president of the Swiss Confederation, Sir Alexander Cockburn, and Mr. Charles Francis Adams. The chief counsel for England was Sir Roundell Palmer, and the American counsel were William M. Evarts, Caleb Cushing, and Morrison R. Waite. The American case, however, was prepared by Mr. J. C. Bancroft Davis. Both the case and the counter-case were prepared and maintained with great ability and acumen, and the arguments were followed with marked interest. More than once, however, a premature termination of the proceedings was threatened by the insistence of the American counsel upon the fact that in estimating the indemnity not only direct damages should be considered, but also such indirect losses as had befallen citizens of the United States through the decrease of trade, the increase of insurance rates, the prolongation of the war, and the additional cost of the prosecution of the war caused by these cruisers. Finally, the claims of the United States for indirect damages were unanimously rejected, on the ground that the principles of international law did not sanction an award of compensation between nations upon claims of that indefinite character. On September 14, 1872, the final award was signed, by which it was decreed that England had incurred no liability arising from the action of the *Sumter*, the *Nashville*, the *Georgia*, the *Tallahassee*, and the *Chickamauga*, or of their tenders, and by a vote of three to two that England had incurred no liability for the work of the *Retribution*. It was, however, determined, by a vote of three to two, that England was responsible for a portion of the acts committed by the *Shenandoah;* by a vote of four to one that England was liable for the results of all the operations of the *Florida;* and by a unanimous vote that England was responsible for all the depredations of the cruiser *Alabama;* and that liability also attached to the acts of the tenders of the *Florida* and the *Alabama*. The consideration of claims arising from the operations of other vessels was excluded for want of evidence. Instead of awarding specific damages apportioned against the several ships and among the several private parties injured, the court awarded a single sum of $15,500,000, as a full indemnity of all claims against Great Britain. This amount was accordingly paid in the following year. In order to determine the claims of private owners, and to distribute the fund among such claimants, Congress created, by the statute of June 23, 1874, a claims court by which judgments were rendered aggregating $9,315,753. A second and similar court was established by the statute of June 5, 1882. The indirect results of this arbitration—which belong rather to the history of international law than to that of the case under consideration—were of even greater importance than its direct results. In strengthening the principle of arbitration as a means of settling grave international differences, in furnishing a high example of justice and disinterestedness in judging between nations, and in defining and elevating the conception of national responsibility, the Geneva tribunal rendered an incalculable service to humanity. The rules laid down for the government of the arbitrators and the court will be found under the title WASHINGTON, TREATY OF. For its permanent contributions to international law, see that title. The circumstances under which the case was submitted to arbitration, and its relation to other questions of difference between England and the United States existing at the time, are explained in the articles on ARBITRATION, INTERNATIONAL LAW, and WASHINGTON, TREATY OF.

BIBLIOGRAPHY. For the most recent and complete work upon the Geneva arbitration, consult: J. B. Moore, *International Arbitrations,* pages 495-682 (Washington, 1898); and for a discussion of the claims courts, pages 4639-4685 of the same work; also Balch, *The Alabama Arbitration* (Philadelphia, 1900); Beaman, *The Alabama Claims and their Settlement* (Washington, 1871); Davis, *Mr. Fish and the Alabama Claims* (Boston, 1893); C. F. Adams, *Life of Charles Francis Adams* (Boston, 1900); Cushing, *The Treaty of Washington,* an authoritative work upon the preliminaries (Washington, 1873); for discussions of special phases of the subject, Bullock, *Secret Service of the Confederate States* (London, 1883); R. Semmes, *The Cruise of the Alabama* (London, 1864); and A. Sinclair, *Two Years on the Alabama* (Boston, 1895). A remarkable collection of printed and manuscript official papers pertaining to the arbitration was made by Hon. J. A. J. Creswell and given to the Johns Hopkins University.

ALABAMA POLYTECHNIC INSTITUTE, originally the ALABAMA STATE AGRICULTURAL AND MECHANICAL COLLEGE. An American college, situated at Auburn, Ala. It was organized in 1872, under the Federal land grant act of 1862. The value of its grounds, buildings, and equipment is $476,000, and its total income is about $71,000. It has a campus and forum of 304 acres; library, 19,000 volumes; faculty, 44; actual number of students, 577, in preparatory, collegiate, chemical and agricultural, pharmaceutical, and engineering courses.

AL′ABASTER (Gk. ἀλάβστ[ρ]ος, *alabast*[*r*]*os,* a box or casket of alabaster, the name of the mineral being ἀλαβαστ[ρ]ίτης, *alabast*[*r*]*itēs,* which according to Pliny, *Nat. Hist.* xxxvii, 10, 54, § 143, was derived from the Egyptian town Alabastron, where it was quarried). A name given to two kinds of white stone, chemically distinct, but resembling each other in appearance, and both used for ornamental purposes.

Alabaster proper is a white, granular, semitransparent variety of gypsum (q.v.) or sulphate of lime. It occurs in various countries, but the finest is found near Volterra, in Tuscany, where it is worked into a variety of the smaller objects of sculpture, vases, time-piece stands, etc. Gypseous alabaster of good quality is also found in Derbyshire, England, and many ornamental articles are made of it at Matlock and other places. Being slightly soluble in water, it cannot be exposed to the weather; and its softness causes the surface easily to become rough and opaque. Nor is it generally found in sufficient masses for large works.

The other stone is a compact, crystalline carbonate of lime, deposited from water in the form of stalagmite, etc. It is distinguishable from the gypseous alabaster by its effervescing with an acid, and by its greater hardness; real alabaster may be scratched with the nail. See GYPSUM.

ALABANDITE, or MANGANBLENDE. A black, sub-metallic mineral manganese sulphide. It often accompanies other ores of manganese, as at Tombstone, Ariz., and Snake River, Col.

ALABASTER, WILLIAM (1567-1640). An English divine, scholar, and poet, born at Hadleigh, Suffolk. He was educated at Trinity College, Cambridge, and in 1596, as chaplain to Robert, Earl of Essex, accompanied the expedition led by the latter against Cadiz. In Spain he was converted to the Roman Catholic faith; but having subsquently again become Protestant, he was appointed a prebendary of St. Paul's Cathedral, and was presented to the living of Tharfield, Hertfordshire. "He was," says Fuller (*Worthies of England*), "an excellent Hebrician, and well skilled in cabalistical learning;" statements verified by such treatises as the *Apparatus in Revelationem Jesu Christi* (1607), and the *Commentarius de Bestia Apocalyptica* (1621), and by his *Lexicon Pentaglotton* (1637). By Anthony à Wood (*Athenæ Oxonienses*) he is with some hyperbole styled "the rarest poet and Grecian that any one age or nation produced." His poetic reputation must depend largely on his Latin tragedy *Roxana* (1632), written in the Senecan manner, and frequently presented in the hall of Trinity. This tragedy was referred to by Dr. Johnson (*Life of Milton*) as the only noticeable specimen of Latin verse of English authorship previous to the appearance of Milton's elegies.

ALACOQUE, ȧ′lȧ′kŏk′, MARGUERITE MARIE (1647-90). A French nun, whose visions gave rise to the adoration of the Sacred Heart of Jesus. She was born in Burgundy, July 22, 1647. She took the veil in the convent of the Order of the Visitation, at Paray-le-Monial, where she is said to have performed miracles, prophesied, made revelations, and held direct communication with God and the angels. She foretold the day of her death (October 17, 1690), and cut the name Jesus Christ on her bosom with a knife. She was beatified by Pius IX. in 1846.

ALACRANES, ä'lȧ-krä'nĕs. A group of small islands, surrounded by dangerous reefs in the Gulf of Mexico, 100 miles north of Sisal, in the State of Yucatan, Mexico.

ALA-DAGH, ä'lȧ-däg' (Turk. Mottled Mountain). A mountain chain in Asiatic Turkey, over 11,000 feet high (Map: Turkey in Asia, K 3). The chief portion of the chain is above the basin of Lake Van, forming part of the water-shed between the Caspian Sea and the Persian Gulf.

ALAD'DIN. The hero of the *Arabian Nights* tale of *Aladdin and the Wonderful Lamp*. He is a poor boy in China, who, through a strange adventure, gets possession of an old lamp and ring of magical properties. A chance rubbing of the former calls to his service a mighty genius (*djinn*), the "slave of the lamp," who quickly brings him to wealth, and, having given him the princess for his bride, builds him a magnificent palace in a single night. Later the lamp is lost, in the absence of Aladdin, through the trick of the African magician who had formerly owned it, and who now, as a peddler, offers the princess "new lamps for old." He by its agency carries off the whole establishment to Africa, but the "slave of the ring" enables Aladdin to follow, and in the end the magician is slain, the lamp recovered, and Aladdin, with his home and bride, returned to prosperity in China. Aladdin's lamp has become a proverbial expression.

ALADJA DAGH, ȧ-lä'jȧ däɢ. A mountain region of Russian Transcaucasia, occupying the eastern part of the province of Kars. It is noted as the place of a decisive engagement between the Russian forces under the Grand Duke Michael and the Turks under Mukhtar Pasha on October 15, 1877. The Russians surrounded the Turkish force, which was entrenched at Aladja Dagh, with the result that a part of them fled toward Kars, while about 7000 surrendered. This victory had a decisive effect on the course of the war.

ALAGOAS, ä'lȧ-gō'ȧs. The former capital of the State of Alagoas, Brazil, situated on the south side of the Lake of Manguaba (Lagoa Manguaba) (Map: Brazil, K 5). Its chief trade is in hides, rum, sugar, cotton, and iron. Pop., 4000.

ALAGOAS. A State of Brazil, formerly a district of the State of Pernambuco, which surrounds it on the north and west. Its southern and eastern boundaries are formed by the River São Francisco and the Atlantic Ocean, respectively. Its area is 22,580 square miles. In spite of the fertile soil and abundance of water, the province is very sparsely settled and agriculture is pursued only on a limited scale, owing to the deadly climate and prevalence of cholera and fever. The chief products are sugar, tobacco, cotton, and some coffee. Pop., 1900, 649,273. Capital, Maceió (q.v.). Consult: *Recenseamento do estado das Alagôas* (Rio de Janeiro, 1898).

ALAI (ä-lī') **MOUNTAINS**. A mountain range of Russian Transcaucasia, in the territory of Ferghana, north of the Pamirs. It consists of a number of parallel ranges, and is separated by the valley of the Waksh River from the Trans-Alai chain. Its average altitude is nearly 16,000 feet, while a few peaks rise beyond 20,000 feet.

ALAIN DE LILLE, ȧ'läɴ' de lēl' (1114 ?-1203 ?). A Flemish Cistercian monk, called "the universal doctor;" distinguished in philosophy, theology, history, science, and poetry. He was appointed bishop, but soon resigned to enter a monastery. He wrote chiefly in verse on alchemy, natural philosophy, and doctrinal subjects. There is confusion about his identity and comparatively little is known of his life; but he received his name from Lille, in Flanders, probably his birthplace.

ALAIS, ȧ'lȧ'. A town of the department of Gard, France, situated in a fertile plain on the right bank of the Gardon at the base of the Cévennes Mountains, 23 miles northwest of Nîmes, with which it is connected by railway (Map: France, L 7). Alais is a very flourishing town, and owes its prosperity chiefly to the mineral wealth of the surrounding district, which produces coal, iron, lead, zinc, and manganese. The blast furnaces, mines, and factories of various kinds give employment to large numbers of men, and Gard may be justly called the Black Country of France. Pop., 1901, 24,940 Alais sided with the Protestants in the religious wars of the seventeenth century, and Louis XIII. in person, accompanied by the Cardinal de Richelieu, besieged it, and having taken it in 1629, demolished its walls. Three years later, the Baron of Alais having taken part in the rebellion of Montmorency, the castle was destroyed. Protestantism still prevails to a considerable extent. Consult *Mémoirs et Comptes-rendus de la Société Scientifique et Littéraire d'Alais*.

ALAIS, PEACE OF. A treaty which ended the Huguenot wars in France. It was signed June 28, 1629, after the taking of Alais by the royal forces, La Rochelle having fallen by the policy of Richelieu the year before. By its terms the fortifications of the Protestant towns were razed and the Catholic worship reëstablished in them, but amnesty and freedom of conscience were granted to the rebels.

ALAJUELA, ä'lȧ-ʜwä'lȧ. The capital of the province of Alajuela, Costa Rica, 13 miles west of San José, and a little on the western side of the water-shed between the Atlantic and the Pacific (Map: Central America, E 5). The city is very prosperous, because of the neighboring coffee and sugar plantations and the large cattle ranches. Here many of the insurrections against the republic had their rise, notably the daring attempt in 1824 of the Spaniard José Zamora to bring the State once more under Spanish rule. Pop., 1903, 4860.

ALA-KUL, ä'lȧ-kōōl' (Kirghiz, Turk., Mottled Lake). The name of two lakes in the territory of Semiryetchensk, on the Russian-Chinese frontier, 64 miles east of the lake of Balkash, Central Asia (Map: Asia, H 4). The Greater, or Eastern Ala-Kul, called also Alsh-Kul, covers an area of 790 square miles, is 39 miles long, 28 miles wide, and has an average depth of about 13 or 14 feet. Its banks are low and sandy, and it is fed by six insignificant streams. The western Ala-Kul or Sassyk-Kulya, separated from the eastern lake by a marshy neck of land 14 miles wide, is but 28 miles long and 11 miles wide, and is fed by small streams. The water of both lakes is salty, and fish is scanty.

ALALONGA, äl'ȧ-lŭn'gȧ, or **ALILONGHI**, äl'ĭ-lŭn'gĭ. See TUNNY.

ALAMAN, ä'lȧ-män', Lucas (1775-1855). An eminent Mexican statesman and historian. For a time he was a deputy of the colony in the Spanish Cortes, but in 1823, upon the downfall of Iturbide, returned to Mexico. As minister of domestic and foreign affairs under two successive administrations he developed industry, agriculture, and education. In 1834 he was director of the industrial commission appointed by Santa Anna, in whose dictatorial measures he subsequently (1853) took part. He wrote an extremely valuable *Historia de Méjico*, chiefly devoted to the nineteenth century (5 volumes, 1849-52). His further publications include *Disertaciones sobre la Historia Mejicana* (1844-49).

AL'AMANCE, Battle of. See Regulators.

AL'AMAN'NI. See Alemanni.

ALAMANNI, ä'lȧ-män'nē, Luigi (1495-1556). An Italian poet. He was born in Florence, and, like Dante, was destined to spend his best years in exile. The Alamanni were zealous partisans of the Medici, whose favor Luigi himself enjoyed until some fancied grievance led him to conspire against the life of the Cardinal Giulio de' Medici, later Pope Clement VII. Being detected, he fled, and eventually took refuge at the French court, where he stood high in favor with Francis I. and afterward with Henry II. Except for a brief interval, when Florence threw of the yoke of the Medici and he returned home to urge, unsuccessfully, that the republic should seek the protection of the Emperor, Charles V., Alamanni spent the remainder of his life in France, and there most of his poems were written. His collected works include translations, epigrams, plays, *La coltivazione*, a didactic poem in imitation of Vergil's *Georgics; Opere toscane*, vigorous satires which have been imitated in English by Sir Thomas Wyatt; and two long poems based upon the Arthurian romances: *Girone il Cortese*, in twenty-four cantos, and the *Avarchide*, in twenty-five, the latter being in structure the story of the *Iliad*, freely adapted to fit the siege of Avarco (the modern Bruges), and chiefly interesting as marking the transition from the complicated adventures of Ariosto's *Orlando Furioso* to the classic unity of Tasso. Alamanni's *Versi e prose*, edited with a biography, by P. Raffaelli, was issued in two volumes (Florence, 1859).

ALAMEDA, ä'lȧ-mā'dȧ. A beautiful residential city in Alameda Co., California. It is six miles across the bay from San Francisco, with which it is connected by ferry lines, and is on the Southern Pacific and the South Pacific Coast railroads (Map: California, B 3). The public library (Carnegie) is a noteworthy feature. The executive power of the city is vested in the president of a board of trustees. The electric light plant is owned and operated by the municipality. Alameda was incorporated as a city in 1885, since which date its growth has been rapid. Pop., 1890, 11,165; 1900, 16,464; 1905 (local census), 18,600.

ALAMINOS, ä'lȧ-mē'nōs, Antonio de. A Spanish pilot, one of the first to take vessels to the North American coast. He was born at Palos, Spain. During the second decade of the sixteenth century he conducted Ponce de Leon, Hernandez de Cordova, Francisco de Garay, and other voyagers who wished to reach the shores of the northern continent. He is supposed to have been the author of the earliest detailed map of a part of what is now the United States, designed to show the limits of claims by discovery. This map was first printed by Navarrete, *Colección* (Madrid, 1829, III. 148).

ALAMO, ä'lȧ-mō, The. A Franciscan mission, built within the present San Antonio, Texas (q.v.), about 1722, and occasionally used after 1793 as a fort. It consisted of a church, an inclosed convent yard about 100 feet square, a convent and hospital building, and a plaza covering about two and one-half acres, and protected by a wall 8 feet high and 33 inches thick. In 1836, during the war for Texan independence, a remarkable conflict occurred here between a small company of Texans and Americans, including Colonel David Crockett and Colonel James Bowie, who held the fort under Colonel W. B. Travis, and some Mexicans who attacked it under Santa Anna (q.v.). After a bombardment lasting almost continuously from February 23 to March 6, a small breach was made in the walls, and early on the morning of the 6th the Mexicans assaulted in force. They were twice driven back with great loss, but scaled the parapet in the third attempt and a desperate hand-to-hand conflict ensued, in which the Texans, though already greatly weakened by privations and fatigue, fought with the utmost valor until only five of their number remained alive. These were captured and, on Santa Anna's order, were killed in cold blood. Three women, two children, and a negro boy alone survived out of a garrison which, including a reënforcement of thirty-two men that arrived on March 1, had numbered about 180. The Mexican loss was probably 500, though Santa Anna, in his untrustworthy report, gave it as 70 killed and 300 wounded. "Remember the Alamo!" became a war-cry of the Texans, who finally defeated and captured Santa Anna at San Jacinto (q.v.). In allusion to the heroism shown by the garrison, Alamo has been called "the Thermopylæ of America." Consult: Ford, *Origin and Fall of the Alamo* (San Antonio, 1896); Corners, *San Antonio de Bexar* (ib., 1890); Williams, *Sam Houston and the War of Independence in Texas* (Boston, 1893).

AL'AMOGOR'DO. A town and the county seat of Otero County, N. M., 86 miles north by east of El Paso, Tex., on the El Paso and Northeastern Railroad (Map: New Mexico, F 3). It is the seat of the Southwestern Baptist College and of the New Mexico Institute for the Blind. Fruit-growing is an important industry of the surrounding section, and the town has saw and planing mills, a tie preserving plant, an ice factory, an artificial stone plant, and railroad shops. Population in 1905 about 4000.

ALAMOS, ä'lȧ-mōs, or **REAL DE LOS** (rā-äl'dā lōs) **ALAMOS** (Sp., the poplars or sycamores). A town in the State of Sonora, Mexico, 125 miles northwest of Sinaloa (Map: Mexico, D 4). The town is unimportant, but the region is famous for its silver mines. Pop., about 10,000.

ALAN, ăl'*a*n, William. See Allen, William.

AL'AN-A-DALE'. One of the companions of Robin Hood (see Hood, Robin) in the old ballads and in Scott's *Ivanhoe*. In the former he is a light-hearted young man, much addicted to the "chanting" of roundelays, whom Robin assists to elope with his love.

ALAND ISLANDS, ä'lȧnd. An archipelago of some 300 small islands and rocks, in the Government of Åbo-Björneborg, Finland, at the entrance of the Gulf of Bothnia (Map: Russia, B 2). The narrow pass of sea separating them on the west from the Swedish coast at Grisslehamn is known as the Åland Bay (Åland Haf). About ninety of them are inhabited. The group has an area of 550 square miles. Pop., 1897, 23,752. Although these rocky isles are covered with but a thin stratum of soil, they bear Scotch fir, spruce, and birch trees, and with proper cultivation produce barley and oats, besides affording subsistence to a hardy breed of cattle. The inhabitants, of Swedish origin, are skillful sailors, fishermen, and seal-hunters. The largest of the islands, which gives its name (signifying "land of streams") to the whole group, is about 18 miles long by 14 broad. It is tolerably wooded and fruitful. These islands belonged formerly to Sweden, but were seized by Russia in 1809. Previous to this they had several times changed hands between these two powers. In 1717 the Swedes were defeated by the Russians in a naval engagement near Åland, the first important exploit of the Muscovite navy. The importance of these islands as a military position led to the construction, in the reign of the Emperor Nicholas I., of those strong fortifications at Bomarsund, which, in August, 1854, were destroyed by the Anglo-French force, commanded by Sir Charles Napier and Baraguay d'Hilliers.

ALA'NI (Gk. *'Αλανοί, Alanoi*). Nomadic tribes of Eastern origin who spread over Europe during the decline of the Roman Empire. They probably were first encountered by the Romans when Pompey, in the Mithridatic War, led an expedition into the Caucasus. In 276 A.D. they were checked by the Emperor Tacitus in their attempt to go eastward into Persia. The Huns gave them a severe defeat on the Tanaïs (now Don) in 375, and then the Alani divided, some going east, but the larger portion joining their conquerors in an onslaught upon the Goths. With the Vandals and Suevi they entered Gaul in 406, and later crossed the Pyrenees and founded settlements in Lusitania, where they lived for some time in peace. In 418 they were attacked by the Visigoths, their king was slain, and they became subject to Gunderic, king of the Vandals, losing completely their national independence. Later they served under the Visigothic king, Theodoric, but they sympathized with the Huns, and their desertion at Châlons (451) came near bringing defeat upon the Roman army. They were mentioned occasionally in later times, and seem to have kept their independence in the East after the sixth century. In 1221 Genghis Khan defeated them, and they were so completely subjugated in 1237 by Batu Khan that their name disappeared from history.

ALA'NUS AB IN'SULIS. See ALAIN DE LILLE.

AL-ARAF, ȧl-ä'rȧf. See ARAF.

ALARCÓN, ä'lär-kōn', HERNANDO DE. A Spanish-American navigator, and the first European to ascend the Colorado River. On May 9, 1540, he sailed, with two vessels, from Acapulco, with instructions from the Viceroy Mendoza to coöperate with the expedition under Vasquez Coronado, which had gone in search of the Seven Cities of Cibola, in what is now New Mexico. Alarcón sailed to the head of the Gulf of California, and completed the explorations begun by Ulloa in the preceding year, by satisfying himself that there was no open water passage between the Gulf and the South Sea or Pacific Ocean. Subsequently he entered the Colorado River, which he named the Buena Guia. With two small boats he ascended the river for a considerable distance, making important observations of the natives. On the second voyage he probably proceeded past the present site of Fort Yuma. He learned that Coronado had reached Cibola, but was unable to communicate with him. A map drawn by Domingo del Castillo, one of Alarcón's pilots, in 1541, is the earliest detailed representation of the Gulf and the lower course of the river, of which it gives a very accurate idea. It was first engraved for the Archbishop Lorenzana in 1770, and is given in *fac-simile* by Winsor, *Narrative and Critical History of America* (Boston, 1886). Consult Winship, "Coronado," in *Reports of Bureau of Ethnology* (Washington, 1895).

ALARCÓN, PEDRO ANTONIO DE (1833-91). A modern Spanish novelist and statesman, born at Guadix, in Granada. He began his professional career as a journalist, and wrote for the *Eco del Occidente* of Cadiz, and after the outbreak of the revolution in 1854 edited for a time a radical satirical paper, *El Látigo*. But he soon withdrew from participation in politics and began the series of short stories and essays which afterward were collected into numerous volumes, such as *Cosas que fueron* (1871); *Amores y amorios* (1875); *Juicios literarios y artísticos* (1883). His share in the Morocco campaign of 1859 bore fruit in his *Diario de un testigo de la guerra de Africa* (1860), a chronicle noteworthy for its vivid picturesqueness and stirring patriotism. For many years after this he took an active part in national affairs, and served successively as deputy, member of the Council of State, and ambassador to the Porte. Of his many later novels, *El escándalo* (1875), written in defense of the Jesuits, made the greatest sensation at the time, and led him to write other novels with religious themes: *El niño de la bola* (1880), and *La pródiga* (1881). But their fame was transitory, and he will be much longer remembered for his less pretentious stories and sketches, his *Historietas nacionales*, and his *El sombrero de tres picos* (1874), a study of rustic manners, truly Spanish in its atmosphere, which shows Alarcón at his best. His last volume was a brief account of his works, *Historia de mis libros* (1884), a sort of literary testament.

ALARCÓN Y MENDOZA, ä'lär-kōn' ā mĕn-dō'thȧ, DON JUAN RUIZ DE (?-1639). A Spanish dramatist of importance, born in Tasco, Mexico. At least as early as 1622 he was in Spain, where he was appointed prolocutor to the royal council for the Indies, and where he published, in 1628, a volume of eight dramas. He added, in 1635, a second volume, containing twelve others. His haughty remonstrance against the inadequate appreciation of his merit made him the object of the often boorish ridicule of Lope de Vega, Góngora, and other contemporary poets. Moreover, many of his works passed current under the names of others, by whom they were appropriated, or to whom they were attributed. Thus, his *Verdad sospechosa* ("Truth Suspected"), which served as prototype for the *Menteur* of Corneille, was by the latter originally referred to Lope de Vega. In the opinion of Ticknor: "He is to be ranked with the very best Spanish dramatists, during the best period of the national theatre." Of his more important plays may further be mentioned: *Las paredes oyen* ("Walls Have Ears") and *El texedor de Segovia* ("The Weaver of Segovia"). The best edition is that of J. E. de Hartzenbusch (Madrid, 1852; Volume XX. of the *Biblioteca de Autores Españoles*). Consult: Ticknor, *History of Spanish Literature* (New York, 1849; sixth American edition, Boston, 1888).

ALARD, ȧ'lär', Jean Delphin (1815-88). A French violinist. He was born at Bayonne, March 8, 1815, the son of an amateur violinist; studied in Paris under Habeneck and Fétis, and won the notice of Paganini when he appeared in concerts. In 1840, Alard succeeded Baillot as first violinist to the king, and in 1843 became professor of the violin at the Paris Conservatoire, a post he held until 1875. Sarasate (q.v.) was among his pupils. He was a representative of the modern French school of violin playing, composed nocturnes, duos, études, etc., for the violin, and was the author of an *Ecole du violon*, which was adopted by the Conservatoire. He died in Paris, February 22, 1888.

AL'ARIC (Goth. from *al*, all + *reiks*, ruler). The great chieftain of the Visigoths. He makes his first appearance in history in 394 A.D., as leader of the Gothic auxiliaries of Theodosius in his war with Eugenius; but after the death of the former he took advantage of the dissensions and weakness that prevailed in the Eastern Empire to invade (395) Thrace, Macedon, Thessaly, and Illyricum, devastating the country and threatening Constantinople itself. Rufinus, the minister of Arcadius, appears to have sacrificed Greece in order to rescue the capital, and Athens was obliged to secure its own safety by ransom. Alaric proceeded to plunder and devastate the Peloponnesus, but was interrupted by the landing of Stilicho in Elis with the troops of the West. Stilicho endeavored to hem in the Goths on the Peneus, but Alaric broke through his lines and escaped with his booty and prisoners to Illyricum, of which he was appointed governor by the Emperor, Arcadius, who, frightened by his successes, hoped by conferring this dignity on him to make him a peaceful subject instead of a lawless enemy (396). In 401 he invaded upper Italy, and Honorius, the Emperor of the West, fled from Rome to the more strongly fortified Ravenna. On the way to Gaul, in 402 or 403, Alaric encountered Stilicho at Pollentia on the Tanarus; and soon after, the result of the battle of Verona forced him to retire into Illyricum. Through the mediation of Stilicho, Alaric concluded a treaty with Honorius, according to which he was to advance into Epirus, and thence attack Arcadius in conjunction with the troops of Stilicho. The projected expedition did not take place, yet Alaric demanded indemnification for having undertaken it, and Honorius, by the advice of Stilicho, promised him 4000 pounds of gold. When, after the death of Stilicho (q.v.), Honorius failed to fulfill his promise, Alaric advanced with an army and invested Rome, which he refused to leave until he had obtained the promise of 5000 pounds of gold and 30,000 of silver. But neither did this negotiation produce any satisfactory result, and Alaric again besieged Rome (409 A.D.). Famine soon rendered it necessary that some arrangement should be made, and in order to do it, the Senate proclaimed Attalus, the prefect of the city, emperor instead of Honorius. But Attalus displayed so little discretion that Alaric obliged him publicly to abdicate. The renewed negotiations with Honorius proved equally fruitless with the former, and Alaric was so irritated at a perfidious attempt to fall upon him by surprise at Ravenna that he advanced on Rome for the third time. His victorious army entered the city August 14, 410, and continued to pillage it for three days, Alaric strictly forbidding his soldiers to dishonor women or destroy religious buildings. When Alaric quitted Rome it was only to prosecute the conquest of Sicily and Africa. The occurrence of a storm, however, which his ill-constructed vessels were not able to resist, obliged him to abandon the project. He died before the close of the year at Consentia (Cosenza), in Bruttium. Legend says that in order that his body might not be discovered by the Romans it was deposited in the bed of the river Busentinus, which was temporarily diverted from its course, and that the captives who had been employed in the work were put to death. Rome and all Italy celebrated the death of Alaric with public festivities. Consult: Hodgkin, *Italy and Her Invaders* (Oxford, 1885); F. A. Gregorovius, *History of Rome in the Middle Ages*, English translation, Volume 1. (New York, 1892); R. Lanciani, *The Destruction of Ancient Rome* (Boston, 1899).

ALARIC II. King of the Visigoths, 485-507. He succeeded his father, Euric. He was of a peaceful disposition, and wished to live on friendly terms with the Franks. His dominions were very extensive. Besides Hispania Tarraconensis and Bætica, he possessed numerous rich provinces in Gaul, and formed an alliance, which still further increased his power, with Gondeband and Theodoric, the latter of whom was his father-in-law and King of the East Goths. At length, however, he came into collision with the Frankish monarch, Clovis, whose cupidity had been excited by the extent and fertility of the territories over which Alaric II. ruled. An excuse was found for breaking the peace which existed between the two nations in the fact that Alaric II. was a zealous Arian. This circumstance had given great offense to many of his subjects, who were orthodox Catholics; and ostensibly to vindicate the true doctrine, the newly converted barbarian Clovis declared war against him. The result was fatal to Alaric II. He was slain by the hand of Clovis himself at Vouillé, near Poitiers, and his forces routed. Alaric II. is said to have been indolent and luxurious in his youth; but this may simply imply that he was not fond of those sanguinary pleasures which captivated his savage contemporaries. He was tolerant in his religious convictions. Though an Arian, he did not persecute the Catholics. He enacted several useful statutes, and kept a watchful eye on all parts of his kingdom. It was during his reign that the *Breviarium Alaricianum*, or Breviary of Alaric II. (q.v.), was drawn up. It is a selection of imperial statutes and writings of the Roman jurisconsults. Alaric II. sent copies of it to all his governors, ordering them to use it and no other. An edition of it was published by Hänel (Leipzig, 1849).

ALARM' (Fr. *alarme*, It. *all'arme*, to arms, from Lat. pl. *arma*, arms). In military usage, a term which is not so important now as formerly. Originally an alarm was signified by the burning of a beacon, the ringing of a bell, beating of drums, or the firing of a gun. Now, in most instances, an alarm is transmitted by telegraph, telephone, signal lamps, and heliograph, among other devices. In military camps, army posts or barracks there is generally an alarm or assembly post arranged, where the troops may assemble in response to calls of sudden emergency, such as fire, riot, or other unusual occurrence.

ALARM. A self-acting contrivance employed to call attention to danger or accidents, or to arouse persons from sleep. The common alarm-clock is a familiar example of such a device, and the electric burglar-alarm is another. The simplest and most common arrangement of burglar-alarm consists of an electric bell with wires leading to all parts of the windows, doors, and other parts of the building to be protected. The terminals of these wires are set in the framing of the windows and doors, so that if they are opened the action presses springs together and rings the bell in precisely the same way as by pressing the ordinary push-button. All special kinds of alarms for house protection consist of modifications in the method of making the contact suitable for special purposes, such as laying sheets of tin under the carpet to make contact with the wires when the carpet is stepped upon. Means are also generally introduced for indicating which window the signal comes from. This is done by leading the wires from each window separately through an annunciator, which shows through which wire, and consequently from which window, the signal came. The alarm will also sound if a window is carelessly left open. The entire wiring of houses is also frequently connected with the police station by wire, so that it is notified of any tampering with the house in the absence of its occupant. Bank vaults and safes are also protected by numerous complicated mechanical and electrical devices which instantly give an alarm to watchmen or police officers of any disturbance due to tampering or attempted burglary. Automatic fire alarms are made in a variety of forms. A frequent arrangement consists of a string supporting a weight whose fall sets in operation a train of mechanism which sounds a bell alarm. The weight is caused to fall by the burning of the supporting string. (See Fire Alarms.) In steam boilers an alarm check valve, operating under the pressure of steam, is employed to give the alarm when the injector ceases to work, or when the water falls below the point of safety. In locomotive boilers a fusible plug is set into the crown sheet over the firebox; this plug remains intact as long as water covers the crown sheet, but melts should it become dry, allowing the steam to escape into the firebox and warn the engineer of the danger. Telegraph and telephone lines usually have some arrangement by which a break in the wires is indicated by a bell alarm. Fog bells, fog whistles, and whistling buoys are forms of alarms, and there are a great variety of other forms, such as alarm compasses, which are contrived to sound an alarm when the vessel deviates from its course; alarm funnels contrived to ring a bell when the liquid has reached a certain height in a cask which is being filled, and typewriter alarm bells which ring as the end of the line being written is approached.

AL′ARO′DIAN. A term derived from the Alarodii of the classical geographers and Herodotus, applied by Sayce and some other ethnographers and philologists to the linguistic stock represented especially by the Georgian among the numerous languages of the region of the Caucasus. The Alarodii dwelt about Mount Ararat, and are supposed by some to be identical with the Urartu of the Assyrian inscriptions.

ALARY, à′lá′rē′, Jules (1814-91). A French dramatic composer. He was born at Mantua, Italy, of French parentage, and was educated at the Milan Conservatory. After frequent tours through Europe he became established at Paris as musical director at the Théâtre des Italiens. Among his principal works are: *Rosamonda*, an opera (Teatro de la Pergola, Florence, 1840); *La rédemption*, an oratorio (Paris, 1851); *Sardanapale*, an opera (St. Petersburg, 1852); *La voix humaine* (Royal Opéra, Paris, 1861); *Locanda Gratis*, opera-bouffe (Théâtre des Italiens, 1866).

ALAS, à-läs′, Leopoldo (1852-1901). A Spanish journalist and novelist, and professor of law at the University of Oviedo. As a critic, he was noted for his intolerance of pretense and mediocrity, and for the fearlessness with which he spoke his mind regarding men of established reputation. As a novelist, he produced an unimportant work, *Su único hijo*, a volume of short stories called *Pipa*, and one serious novel, *La regenta*, an analytical study of criminal passion, revealing a rare subtlety of observation. He was the author of a drama, *Teresa*. His knowledge of European literature was extensive. In journalism he was best known under the pseudonym of Clarín.

ALAS′CANS. A designation of foreign Protestants in London in the time of Edward VI. from the name of John à Lasco (or Laski), a Polish reformer and refugee, who, in 1550, was appointed by the King as superintendent of the foreign congregation there.

ALAS′CO. In Scott's *Kenilworth* (q.v.), an astrologer, also known as Dr. Demetrius Doboobie, who aids the evil designs of Richard Varney against Amy Robsart.

À LASCO, ä läs′kô, Johannes, or Jan Laski (1499-1560). A Polish nobleman and traveler, born in Warsaw. He imbibed the doctrines of Zwingli at Zürich. He also knew Erasmus, who esteemed him highly, and in his will provided for the sale of his library to him. He returned to Poland, 1526, but left in 1536, on his declaration of Protestantism, and went to Frisia. There he preached Protestantism, but, anticipating persecution, he went to London, on Cranmer's invitation, and became superintendent of the congregation of the foreign Protestant exiles. On the accession of Mary, in 1553, he and all his congregation were banished. In 1556, he returned to Poland, where he died, at Pirchow, January 13, 1560. He wrote many treatises, and was one of the eighteen divines who prepared the Polish version of the Bible. For his biography, consult H. Dalton (London, 1886).

ALASHEHR, ä′lȧ-shĕhr′ (Turk. Mottled City). A city in the Turkish vilayet of Aidin, or Smyrna, lying about 75 miles east by south of Smyrna, on the northern slope of Mount Tmolus (Map: Turkey in Asia, C 3). It is surrounded by a partly ruined wall, and contains eight mosques and five Greek churches. Remains of ancient sculpture are to be found. Alashehr is connected by rail with Manissa, and is the seat of a Greek archbishop. The population is estimated at about 20,000. Alashehr was founded by Attalus Philadelphus, King of Pergamos, about 200 B.C., and is supposed to be one of the "seven churches of Asia" mentioned in the Apocalypse.

ALASKA. The largest outlying possession of the United States, forming a jutting land mass at the northwestern extremity of North America. According to measurements taken in 1906 its total area is 586,400 square miles. The territory ceded by Russia in 1867 (see HISTORY), and known up to that time as Russian America, was called Alaska by William H. Seward, this being a corruption of the Aleut word *alak'-shak* or *al-ay'ek-sa*, meaning a great country or continent. It is bounded on the north by the Arctic Ocean, on the west by the Arctic Ocean, Bering Strait, and Bering Sea, on the south and southwest by the Gulf of Alaska, and the Pacific Ocean, and on the east by Canada (Yukon Territory and British Columbia). The eastern boundary from the Arctic Ocean to Mount St. Elias (a distance of 650 miles) is the 141st meridian; thence southwestward to Portland Canal it is a sinuous line (see BOUNDARY DISPUTE) about 660 miles in length. Alaska extends from 129° 58′ west to 172° 22′ east longitude, and from 51° to 71° 25′ north latitude. It falls between about the same parallels as Sweden, and Juneau, its capital, is in about the latitude of Edinburgh. The meridian reached by the westernmost of the Aleutian Islands passes near the New Hebrides Islands and through New Zealand. Cape Prince of Wales, the most westerly point of the mainland, is nearly as far west as the Samoan Islands.

TOPOGRAPHY. The main mass of Alaska is nearly rectangular, carved out from the continent by Mackenzie Bay on the north and the Gulf of Alaska on the south. An extension to the southeast is furnished by a panhandle—usually called Southeastern Alaska—and another to the southwest by the Alaska Peninsula and the Aleutian Islands. The latter, in conjunction with the Commander Islands of Siberia, forms a broken barrier between Bering Sea and the Pacific Ocean. East of this, and parallel to it, lies the Kenai Peninsula, bounded by Cook Inlet on the west and Prince William Sound on the east. The Seward Peninsula extends westward from Central Alaska, and with the Chuckchee Peninsula of Siberia, from which it is separated by Bering Strait, only 54 miles wide, divides Bering Sea from the Arctic Ocean. The coast line of the territory is of two distinct types. Northward from the Alaska Peninsula shallow water conditions prevail, the coast line is regular, and the land slopes gently from the shore. Eastward and southward the shores are usually abrupt, deep water is found near the land, and there are many embayments and islands. The largest of these islands is Kodiak, which with adjacent islands forms a southwestern extension of the Kenai Peninsula. Southeastern Alaska embraces a narrow strip of mainland and the Alexander Archipelago, which fringes the coast for some 300 miles. The largest islands are Chichagof, Baranof, Admiralty, Prince of Wales, and Revillagigedo. The many straits, fiords, and canals of this part of the Territory, together with the rugged mountains of the mainland, have made its scenery world-famous.

Alaska is divisible into four geographic provinces, which named from south to north are: the Pacific Mountain system, the Central Plateau region, the Rocky Mountain system, and the Arctic slope region. (1) The Pacific Mountain system is a rugged highland belt 50 to 200 miles wide, skirting the southern shore line. It comprises four distinct ranges,—the Coast, the St. Elias, the Aleutian and the Alaska,—and includes several large basins, notably those of the Copper and Sushitna rivers. The Coast Range stretches through Southeastern Alaska. It is 5,000 to 8,000 feet in height and 50 to 80 miles in width. From its northern part many glaciers discharge into the sea. The St. Elias Range extends northwestward from Cross Sound, bends westward near the mouth of Copper River, and near the head of Prince William Sound (long. 147°) turns sharply southwestward and merges in the highlands of the Kenai Peninsula. Much of the seaward slope is covered by glacial ice. Near longitude 142° the chain is parted by the valley of the Chitina River into divergent ranges. The southern, called the Chugach Mountains, (8,000—10,000 feet high), continues the main range across the head of Prince William Sound. The northern, called the Nutzotin Mountains (7,000—10,000 feet high), stretches westward and forms a connecting link between the St. Elias and Alaskan ranges. Between these two forks is a group of volcanic peaks called the Wrangell Mountains, of which Mount Sanford (16,200 feet) is the highest. The St. Elias range varies in width from 50 miles near Cross Sound to nearly 100 miles near Mount St. Elias, and then to less than 20 miles in the Kenai Peninsula. Near Cross Sound some peaks rise abruptly from tidewater to over 15,000 feet. Westward the range increases in height and complexity, culminating in Mount St. Elias (18,024 feet) and Mount Logan (19,500 feet). The former marks the international boundary, the latter lies in Canadian territory. The Aleutian Range forms the backbone of the Alaska Peninsula. It rises directly from the sea near the southwestern extremity of the peninsula, and skirts the Pacific shore as far as the entrance to Cook Inlet. At this point a broad lowland intervenes and throws the axis to the west; the range (here sometimes called the Chigmit Mountains) continues northward to about latitude 61°, and there falls off abruptly to a lowland. The range is widest near latitude 58°,—northward from which it rapidly narrows. The Alaska Range extends northeastward from the vicinity of Lake Clark and sweeps around the great Sushitna and Copper river basins, forming the water-shed between the Pacific drainage on the south and east and the Kuskokwim and Yukon waters on the north and west. It averages 50 to 60 miles in width. Its southern end has been little explored, but probably has no peaks higher than 5,000 or 6,000 feet. Toward the north the relief increases: Mount Spurr measures 10,500 feet, Mount Russell 11,300 feet, and Mount Dall 9,000 feet. Mount McKinley (lat. 62° 30′), according to measurements taken in 1905, reaches 20,300 feet, the highest on the continent; and Mount Foraker, 14 miles to the south, 17,000 feet. These two though visible from Cook Inlet and known to whites for more than 100 years, were not indicated on maps until 1898. Mount McKinley was known to Russians as

'Bulshaia' and to the natives of Cook Inlet as 'Traleyka.' Both names signify high or big mountain. In 1895 it was named Mount McKinley by W. A. Dickey, who ascended the Sushitna River and called attention to its tremendous height. In 1898 George H. Eldredge and Robert Muldrow, of the United States Geological Survey, determined its position and altitude; and the following year Lieut. Joseph S. Herron, U.S.A., named the second high peak Mount Foraker. In 1902 a more extended exploration of the range was made by Alfred H. Brooks and D. L. Reaburn, of the United States Geological Survey, who were the first white men to reach the base of Mount McKinley. The eastern end of the Alaskan Range is of lesser altitude, Mount Hayes (15,000 feet) and Mount Kimball (10,000 feet) being the highest peaks.

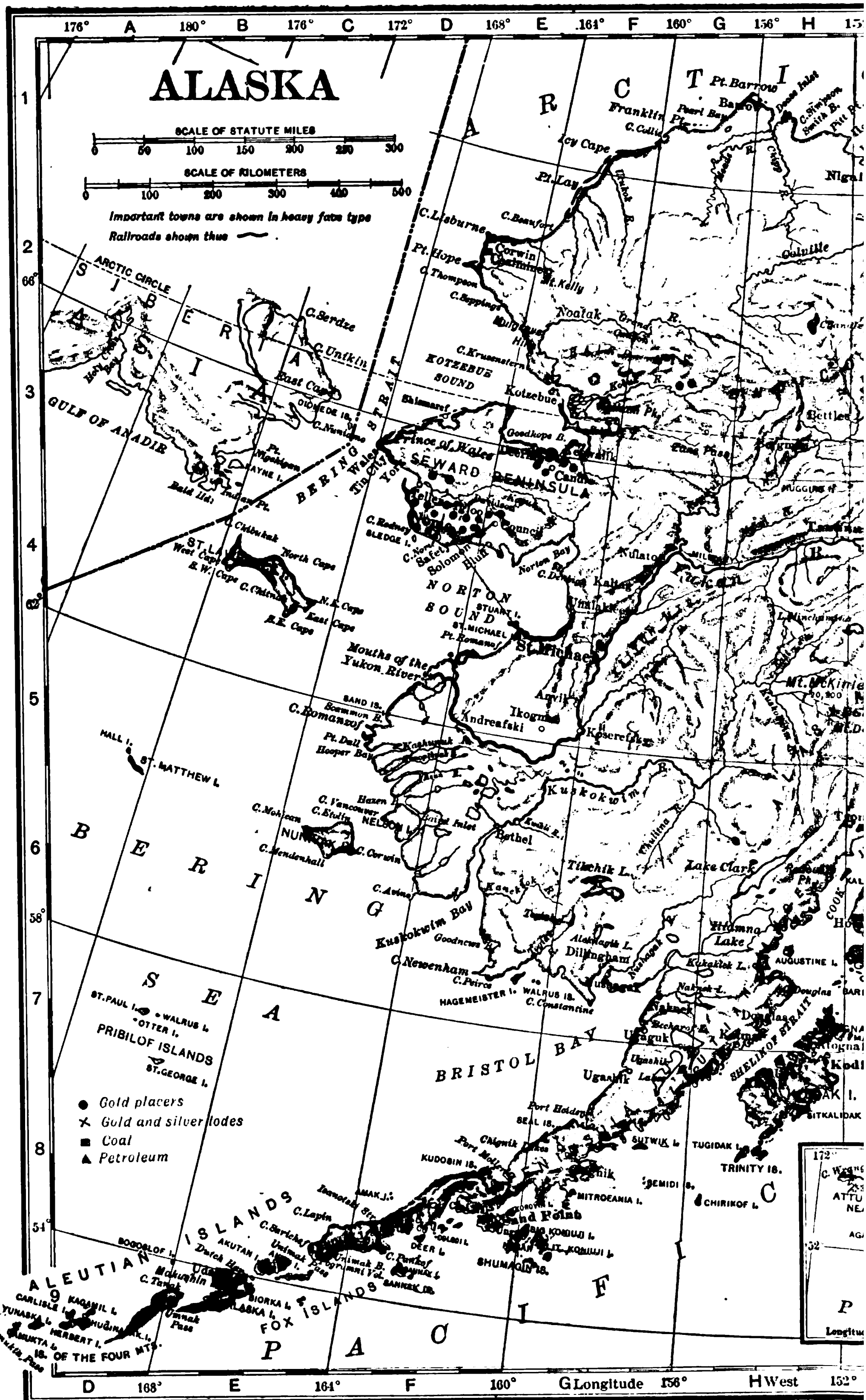
(2) East and north of the Pacific Mountains is the Central Plateau region, 200 miles wide, corresponding with the Great Basin region of the western United States. Though formerly a plateau, this region has changed in character. The rivers have trenched broad channels through it, giving it the appearance of a rolling upland with summits of uniform level. The plain of these summits is 4000 feet at the international boundary, and falls off gradually to 1000 feet near Bering Sea.

(3) The Rocky Mountain system of North America continues northwestward nearly to the Arctic Ocean, then turns almost at right angles, crosses the international boundary in about latitude 68°, and stretches across northern Alaska, finally dying out before it reaches the Arctic Ocean. It enters Alaska as a mountainous belt over 100 miles wide, consisting of several more or less distinct ranges separated by broad, low gaps and containing peaks 7000 to 8000 feet high. The western extension, known as the Endicott Mountains, is little known, but appears to comprise two or more ranges 4000 to 6000 feet in height.

(4) The Arctic Slope region begins as a slightly elevated plateau, dissected and more or less rolling, which slopes to the north from the foothills of the Rocky Mountains. This plateau terminates abruptly in a scarp, from which a featureless coastal plain, of varying width, stretches to the Arctic Ocean.

About one-fifth of the drainage of Alaska is toward the Pacific Ocean, nearly one-half toward Bering Sea, and the rest toward the Arctic Ocean. The Pacific drainage embraces two classes of rivers; first, those which rise among the coastal mountains; and second, those which traverse the mountains on their way to the sea. Of the first the Sushitna and Copper, and of the second the Alsek, Taku, and Stikine are the most prominent examples. The Yukon (5th in size of North American rivers) is the master stream and its basin practically comprises the Central Plateau province. With its longest tributary (the Yukon is formed by the union of the Pelly and Lewes) it is about 2400 miles in length, and its discharge at low water is about 500,000 cubic feet per second. Other chief tributaries of the Yukon are the White, the Porcupine, the Tanana, and the Koyukuk. The headwaters of the Lewes are but 25 miles from the coast at Lynn Canal. Two passes, the Chilkoot (3100 feet) and the White (2800 feet), break the Coast Range at the head of Lynn Canal and afford routes into the interior, which were used by thousands of gold seekers during the Klondike excitement of 1897 and 1898. A railway over the White Pass now connects tidewater with navigable waters on the Lewes River. The Kuskokwim River, second in size to the Yukon, empties into Bering Sea. Its length is about 1200 miles, and it has many unexplored tributaries. The Arctic drainage includes the Selawik, Kobuk, and Noatak rivers, flowing westward into Kotzebue Sound; and the Meade, Chipp, and Colville rivers, flowing northward into the Arctic Ocean.

CLIMATE. The range of climate in Alaska is greater than that from Florida to Maine. Only the northern third of the Territory can be said to have a distinctly arctic climate, while the southern seaboard is made comparatively temperate by the warm waters and winds of the Pacific. The records at Sitka in southeastern Alaska show for August, the hottest month, a range of 35° to 87° F.; and for February, the coldest month, a range of 3° to 54° F. The mean annual temperature is 43° F., about the same as that of Christiania, Norway. At Fort Tongass, the extreme southeastern point of the Territory, the records indicate a mean annual temperature of 48°. In southeastern Alaska frosts occur from October to April. The snowfall is light at sea level, but heavy in the mountains. The moist winds of the Pacific precipitate their waters along the coastal zone in a rainfall varying from about 130 inches at Fort Tongass to 84 inches at Juneau. April and July are the driest months. Between Cross Sound and Cook Inlet the rainfall is somewhat less, as is also the mean annual temperature. But few climatic observations have been made in the Copper River basin, but it is known to be drier and colder than on the coast. Extreme temperatures of 94° F. in August, and —53° F. in December have been recorded. The snowfall is 2 to 4 feet. Frosts occur throughout the year, but are rare in June, July, and the early part of August. Valdes on Prince William Sound has a summer temperature 5° colder and a winter temperature 10° colder than Sitka, and probably 50 per cent. less rainfall, with a snowfall of 7 to 8 feet. Cook Inlet and the adjacent region to the north have bright, clear weather in summer and cold winters. The extremes of temperature at Kenai (east side of Cook Inlet) are 82° F. in July, and —43° F. in December, with a precipitation of about 17 inches. The Alaska Peninsula and Aleutian Island region has a climate similar to that of northern Scotland, with a rainfall varying from 24 to 48 inches and a mean annual temperature of about 40°. The Bering Sea coastal province has a rainfall varying from 33 inches at Bristol Bay to 18 inches at St. Michael. At St. Michael the mean annual temperature is 26° and frosts occur from September to June. The northern half of Bering Sea is frozen from November until April, but St. Michael harbor is closed from the end of September until the middle of June. At Nome and in the Seward Peninsula, June and July are often dry and clear, but the rains usually begin in the middle of August, often accompanied by high winds, and stormy weather prevails until snow comes early in October. The Arctic Coast of Alaska has a precipitation of about 8 inches. The extremes of temperature are —55° F. and 80° F.; the mean is less than 8°. The Arctic Ocean is usually locked in ice from early in September until July.



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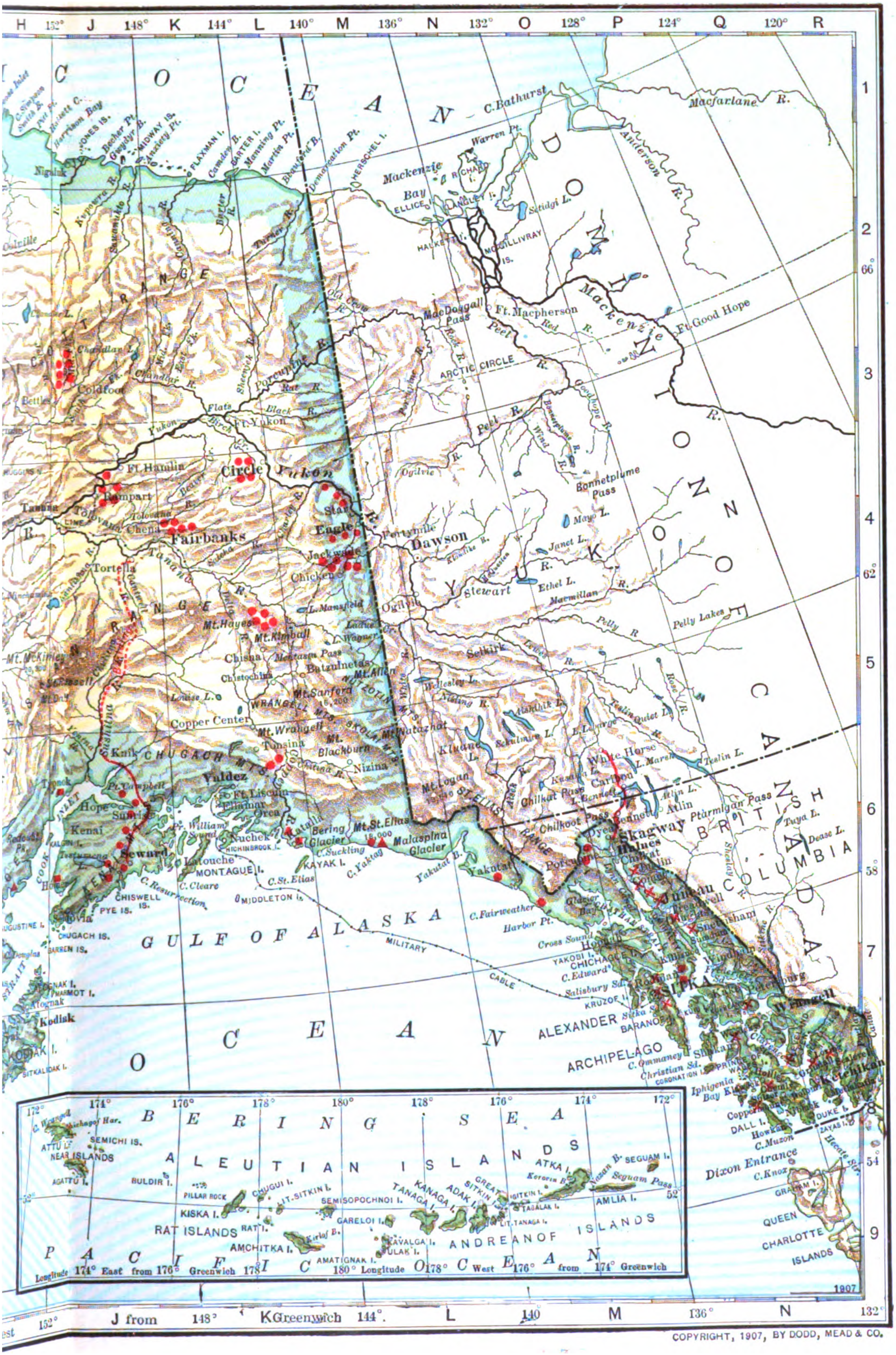

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The climate of the interior is continental in character: semi-arid with great extremes of heat and cold. From Bering Sea inland the humidity gradually decreases, until at the international boundary the annual precipitation is less than 10 inches. Here extremes of temperature of 90° F. in summer and —76° F. in winter have been recorded. The mean annual temperature at Eagle is about 21° F. Frosts occur throughout the year but are rare between the middle of June and the middle of July. Snowfall aggregates 2 to 3 feet. The Yukon breaks about the middle of May and closes early in November, but on account of running ice is usually navigable only from June 1st to September 20th.

FAUNA. Among the large animals of Alaska the most important are bear, moose, caribou, sheep, goats, and deer. Deer are found in abundance in southeastern Alaska and the adjacent islands, but not elsewhere. Goats occur only in the higher ranges of the Pacific seaboard, but the white sheep (bighorn) is found throughout the higher parts of the Rocky Mountain system. At least two varieties of the caribou are met with: the larger, called the woodland caribou, is abundant in the timbered regions of the interior; while the smaller, known as the wild reindeer, or barren ground caribou, meanders in large herds over the timberless northern areas. Moose, though formerly abundant in the timbered valleys, are becoming scarce in localities visited by white men. Black bear are widely distributed in the coast and inland regions, but are not found in the barren grounds. The true grizzly probably occurs only in the coastal strip of the Panhandle. There are many varieties of brown bear, the largest of which is the so-called Kodiak bear, which is found on the island of the same name. A closely allied variety, the Alaska brown bear, is found on adjacent parts of the mainland. Smaller varieties are found in the barren grounds. The white polar bear is indigenous only in the extreme north, but occasionally one is carried through the straits into Bering Sea. Of the smaller fur-bearing animals there are wolves, wolverines, foxes, beavers, muskrats, otters, mink, weasels (ermine), and sable. Many of the birds of the temperate zone are found in Alaska during the summer months. The ptarmigan occurs throughout the territory, and the raven and eagle are plentiful in southeastern Alaska. Reptiles and amphibians are scarce, but there is a great variety of insect life, among which the mosquito is most conspicuous throughout the Territory. The marine mammals include whales (several varieties), porpoises, walrus, sea lion, hair and fur seal, and sea otter; but the last-named is nearly extinct. Fish occur in great variety and abundance. The salmon, white fish, and Arctic trout are the most plentiful and widely distributed.

FLORA. In the distribution of vegetable life three broad subdivisions can be recognized: the Pacific coastal province, the inland province, and the tundra province. The first is heavily forested as far west as Cook Inlet; the second has a sparser growth of timber, confined chiefly to the lowlands; while the third is bare of all trees, except stunted willows along the water courses. Luxuriant forests cover the humid and even-tempered region of southeastern Alaska and stretch westward as far as Prince William Sound. Hemlock and Sitka spruce are the dominating varieties, the former extending as far westward as Kodiak Island, the latter to Prince William Sound. Of the deciduous trees cottonwood, alder, and willow are the most abundant. The devil's club is abundant throughout the coastal belt, reaching a height of 8 or 10 feet on Prince of Wales Island, but only 2 or 3 feet on Cook Inlet. The valuable red cedar is found as far north as Prince of Wales Island, but is not abundant. The yellow cedar is more plentiful as far west as Yakutat Bay. The upper limit of timber, about 4000 feet at Dixon Entrance, decreases to the north and is less than 2000 feet on Prince William Sound. Hemlock, spruce, and cedar trees occur as large as 6 feet or more in diameter, and find extensive local use, though the law prohibits exportation of lumber. The local sawmills furnish lumber for buildings and mining purposes, and for boxes used in shipping salmon. Afognak and Prince of Wales islands have been set aside as forest reserves. The high mountain barrier has generally prevented intermingling of the coastal and interior species. Spruce (black and white) predominates in the interior, but poplar, aspen, white birch, and alder are also common. In the lower Tanana valley tamarack has been found. Near the international boundary the timber line is about 3000 feet above the sea, but along the northern tributaries of the Yukon and the rivers flowing into Kotzebue Sound falls to less than 1000 feet. Heavy forest growth is confined to the valley floors, often to a narrow fringe along the water courses. On the Yukon and some of its larger tributaries spruce trees 2 feet or more at the butt are occasionally found, but as a rule the maximum diameter is 16 to 18 inches. The interior forests, if preserved, will yield ample supply for local use, but the arid conditions and the carelessness of both natives and whites have caused much destruction by forest fires. The third province, the tundra, embraces the coastal region northward from the Aleutian Islands (which are themselves timberless) to Point Barrow and eastward to the international boundary. The surface is covered with moss and herbaceous plants, with a little fine shrubbery, and fringes of stunted willow along the water courses. The only break in this treeless belt is on the North shore of Norton Sound, where some spruce forests occur. Throughout Alaska the abundance and variety of wild flowers are striking. Many of these are kindred to species common in the United States. Grasses are very abundant in the Cook Inlet, Copper River, and Yukon River regions, and are also found in sheltered parts of the tundra region.

GEOLOGY AND MINERAL RESOURCES. Some gneisses and schists (Archæan?) which occur in the Yukon basin are the oldest rocks of Alaska. The next higher horizon embraces a great complex of altered sediments with many igneous rocks, which are in part Ordovician, Silurian, and Devonian. These form a broad belt stretching between the Yukon and the Tanana, and the same terrain is probably represented in the Seward Peninsula and in the Panhandle. Devonian, Carboniferous, Triassic, Jurassic, and Cretaceous beds have been found widely distributed. The Tertiary is represented by coal-bearing beds which occur in the Pacific, interior, and Arctic provinces. Extensive sheets of recent gravels, sands, and silts mantle much of the Territory. The Coast Range of southeastern Alaska is made up almost entirely of granite. Extensive volcanic ejecta occur in the Copper River basin, the Alaska Peninsula, and the Aleutian Islands. There are active volcanoes in all three of these districts. The mountain ranges throughout Alaska are the results of erosion in areas of very recent uplift. During the glacial period the Panhandle, with the exception of some of the higher peaks, was buried in ice, which channelled out the valleys now remaining as fiords. The same ice cap stretched inland over the Coast Range and extended northwestward down the valleys of the tributaries of the Yukon to about latitude 62°. During this period the St. Elias, Alaska, Aleutian, and Endicott mountains were centres of ice accumulation, which did not, however, extend far into the adjacent lowlands. The fast disappearing remnants of these former ice sheets are the glaciers of the Pacific ranges. During the maximum extension of the ice it covered less than one-fifth of Alaska. The areas now covered by ice and perpetual snow aggregate less than 20,000 square miles. The developed mineral resources include gold (placer and lode), silver, copper, coal, gypsum, marble, and mineral water. Of prospective value are the deposits of lead, zinc, iron, tin, and possibly petroleum and mercury. The highly altered rocks of the Panhandle are the locus of most of the auriferous lode mining and also contain some placer gold, silver, and copper. This belt appears to be continued in the Prince William Sound and Kenai Peninsula region, where it carries gold and copper. The inland placer-bearing districts (including Fortymile, Fairbanks, etc.) lie in another belt of highly altered rocks, which also appears to crop out in the Seward Peninsula, where rich placers have been found. Copper-bearing rocks occur both on the north and south slopes of the Wrangell Mountains. The coal-bearing area of Alaska is at least 20,000 square miles. Coal has been found in four different horizons: in the Carboniferous and Jurassic near Cape Lisburne, and in the Cretaceous and Tertiary of the Yukon and Pacific coast regions. The last is the most important, and near Controller Bay and in the Matanuska valley has yielded high grade bituminous and semi-anthracite coals. Lignite coals are very widely distributed. Marble, gypsum, and mineral waters have been found in commercial quantities in the Panhandle; where iron, zinc, and lead deposits are also known to occur. Petroleum seepages occur at several places along the seaboard between Controller Bay and Cook Inlet. Tin (cassiterite) is found near Cape Prince of Wales, and mercury (cinnabar) in the Kuskokwim basin.

MINING. Though the Russians knew that both gold and copper occurred in Alaska, they made no effort to develop it. Their only attempt at mining was to open up a coal deposit on Cook Inlet in 1854. Gold was found at Sitka in 1876, but it was first mined extensively at Juneau, where it was discovered in 1880. Placer gold in the interior was first found on Fortymile River in 1886, and this was followed by the discovery of the Birch Creek and Rampart districts in 1893. The annual output of gold from the inland region rose slowly until by 1895 it amounted to $800,000; the mining population was then about 1600 men. Meanwhile the coastal region had made steady progress: by 1888 the Treadwell mine on Douglas Island, near Juneau, had become one of the great gold-producers of the world, while a number of smaller mines in the vicinity were developed. The Apollo mine on Unga Island in southeastern Alaska was opened in 1886, and the Cook Inlet placer fields were discovered in 1894. It was the discovery of the Klondike gold placers (1896), close to the international boundary but on the Canadian side, which first attracted large numbers of prospectors to Alaska; but no important discoveries of mineral wealth were made in Alaskan territory until 1899, when the Nome placers were found. The gold production of that year, about $6,000,000, was nearly double that of 1898. Since 1899 many new gold-bearing areas have been discovered, and marked progress has been made in the placer mining industry. The Fairbanks district on the Tanana was discovered in 1902, and in 1905 yielded nearly $6,000,000. The cost of mining operations has gradually decreased until it is now in many districts less than one-tenth of what it was in the pioneer days. A large increase in the annual production is to be expected from the improvement of mining methods alone, even if no new placer fields are found. About one-fifth of the annual production of gold in 1905 was taken from lode mines; and with the single exception of one in the Seward Peninsula, these are all in the Pacific coastal belt. The annual output of gold has increased from $2,300,000 in 1895 to $15,000,000 in 1905. About $4,500,000 of this is taken from the Seward Peninsula, and about $7,000,000 from the Yukon district. The total production of gold from 1880 to 1905 was about $80,000,000. The lode mines of southeastern Alaska produce some silver. Copper mining began in 1901 at Prince William Sound. In 1905 two copper mines were in operation on Prince William Sound and three on Prince of Wales Island, where there are two copper smelters. The total copper production in 1905 was about 30,000 tons of ore, valued at $700,000. The inland copper districts, notably those of Copper River, 200 to 300 miles from the coast, are not developed (1905), but sufficient work has been done to indicate their value, and a railway is planned to reach them from Prince William Sound. Up to 1905 coal mining was limited to some of the lignites of the Pacific Coast and Yukon regions for local use. There has been, however, active prospecting in the bituminous and anthracite fields of the Controller Bay and Matanuska River regions, where seams 5 to 30 feet thick have been found. A railway is being built to tap the Matanuska field, and another has been surveyed to tap the Controller Bay field.

FISHERIES. Fish have always been an important source of food supply for the natives, among whom the salmon, white fish, tomcod, and inconnu fish are most used. The most important of the fisheries are the salmon, cod, halibut, herring, and whale. Whaling, begun about 1840, is the oldest of the fishing industries, but is now on the decline. The catch of the whaling fleet from 1874 to 1900 was valued at about $11,200,000. The total value of the salmon catch up to the close of 1905 is estimated as $80,000,000. The first salmon cannery was established on the Alaskan Coast in 1878. In 1905 there were a score or more in operation, and their output was valued at $8,381,466. There are many species of salmon, of which the king (the largest), silver, red, and humpback are the most important. They are very widely distributed, being found along the entire Alaskan Coast, but are caught only at the mouths of the streams which they ascend during spawning season. Bristol Bay is the most important salmon-canning centre, but there are several others along the coast southward as far as the boundary. The indiscriminate catching of salmon has already notably reduced the supply, and unless more stringent laws are enforced, the canning industry must decline. The cod fisheries of Alaska are one of its most valuable assets, though as yet but little exploited. The catch in 1905 was valued at $135,000. Cod banks are scattered along the entire coast line as far north as the southern part of Bering Sea. Halibut are very abundant along the Pacific shore, but the annual catch is not large. Immense shoals of herring visit the bays and estuaries, and a small but thriving industry has grown up in the conversion of herring into oil and fertilizer.

AGRICULTURE. Alaska has at least 50,000 square miles of arable lands: twice as much as the agricultural land of Finland, a country which not only supports a population of 2,500,000, but exports butter, cheese, grain, and livestock. Because of the high cost of labor, Alaska can support only small farms, but these can be made to yield an ample return because of the abundant local market. In 1903 the homestead law was extended to Alaska and modified to permit the acquiring of 320 acres for agricultural purposes. There being no public land surveys, each homesteader has to make surveys at his own expense, with the result that but little land has been taken up. Climate and location make southeastern Alaska the most favorable for agriculture, but the heavy forest growth entails an almost prohibitive cost for clearing the land in anything except small patches. Moreover, much of this region is too rugged for the purpose. At Sitka wheat, barley, rye, oats, and a great variety of vegetables, together with strawberries, gooseberries, raspberries, and currants, have been successfully raised. The growing season is from May to October. In general the same conditions prevail to the westward as far as Cook Inlet, though the climate is somewhat colder. The region adjacent to Cook Inlet and the Sushitna valley is the most promising for agriculture. Here the abundance of native grasses is evidence of a soil suitable for hay; wheat, barley, oats, buckwheat, clover, potatoes, and many vegetables have been successfully matured. The growing season extends only from about the first of June until September, but the long days and almost continuous sunshine mature plants very rapidly. On the Alaska Peninsula and adjacent islands the abundance of good grass will undoubtedly mark this for a stock-raising region. The Copper River district is also a good grass country, and barley, oats, and rye, as well as many vegetables, have been matured. In the Yukon valley vegetables have been extensively raised for local use. Oats, rye, and barley have been raised at Rampart. The Tanana valley is probably the most favorable part of the interior for agriculture, but so far only vegetables have been raised there. Hardy vegetables have been matured in the Koyukuk valley north of the Arctic Circle. Grass grows luxuriantly throughout the Yukon basin. The growing season is confined to 2 months in midsummer, but this is partly compensated for by the length of the Arctic summer day.

FURS. The fur trade first attracted the Russians to Alaska, and continued to be the leading industry until the development of the gold mines. The most valuable fur-bearing animal is the sea otter, formerly numerous along the entire Pacific Coast line, but now found only on some of the Aleutian Islands and threatened with extermination. The killing of the sea otter by any except natives is now prohibited by law. It is estimated that during the Russian occupation 260,800 sea otter skins were taken, valued at $26,000,000. Since 1867 about 90,000 sea otter skins have been marketed, but the present annual output is probably less than a score. Good skins are now worth from $800 to $1200 in the London market. The fur seal industry, though developed by the Russians, reached its greatest expansion since the transfer of the Territory. It is estimated that from 1745 to 1867 3,350,000 fur seals were taken. From 1867 to 1902 2,524,082 skins to the value of $35,000,000 were exported. The fur seal, though during part of the year widely distributed in the northern Pacific and Bering Sea, has only one breeding ground in Alaska, on the Pribilof Islands (lat. 57° N., long. 170° W.), where most of the skins have been taken. In 1870 the capture of seals on these islands, except by government permit, was prohibited by law, since when the islands have been leased to companies who pay a royalty on each skin. Regulations are, however, futile, in stopping the pelagic sealing of the Canadians, and each year the depleted rookeries give evidence of the gradual extermination of the seal. The catch on the islands in 1905 was about 14,000 skins, and probably as many more were taken by the pelagic sealers. Of the land fur-bearing animals the most important now are the fox, beaver, marten, and mink. Foxes are found in great abundance and variety. The silver gray fox yields the most valuable skin, worth $75 to $150. Fox farms have been established on some small islands of the Pacific Coast, which are leased from the Government. In view of the gradual extermination of the wild caribou in certain districts, attempts have been made to introduce the domesticated reindeer among the natives, but with only partial success. Though the work has been going on for 13 years, as yet only 78 natives own deer, nearly two-thirds of the entire herd being in the hands of white men. Since 1892, 1280 deer have been imported from Siberia, and in 1905 there were 10,241 distributed in 15 different herds, chiefly in control of the mission stations. The reindeer, though he has not been able to supplant the dog as a draft animal, is eminently adapted to Alaska, which affords at least 50,000 square miles of pasture for them. Eventually the reindeer will furnish an important source of food supply, as well as furs. It is estimated that the entire production of furs from 1867 to 1903 had a value of $52,000,000. The production during 1905 was valued at $500,000.

MEANS OF COMMUNICATION. The Pacific Coast line of Alaska, including the Aleutian Islands, has many excellent harbors. These are open to navigation throughout the year, with the exception of Cook Inlet, which is closed by ice from November until May. The northern half of Bering Sea is closed to navigation from about November 1st to June, but the pack ice does not come far south of St. Lawrence Island. This part of the coast is almost without harbors. The Arctic Ocean is open only from July to September. Inland travel is chiefly through Canadian territory: over the White Pass from Skagway, by the White Pass and Yukon Railway to White Horse (100 miles) and then down the Lewes River to the Yukon. The journey from Skagway to Eagle takes about four days. Much freight is shipped up the Yukon by steamer, a three weeks' journey from St. Michael. The Yukon drainage system includes about 4000 miles of water navigable for steamers. The Copper River region can be reached by trail from Valdes. Most of the freight for this region is transported in winter. The Cook Inlet placer fields can be reached by the Alaska Central Railway from Seward on Resurrection Bay, and this line is to be extended inland along the Sushitna River across Broad Pass to the Tanana River and Fairbanks (distance 440 miles). Railways have also been projected from Valdes over Marshall Pass to the Copper River and thence to Eagle (distance 400 miles), and from Orca along the Copper River to Eagle (distance 440 miles). The Yakutat and Southern Railway, about 10 miles long, was built to bring salmon to the cannery at Yakutat. There are 3 railways in the Seward Peninsula: the Nome Arctic (9 miles), the Council City and Solomon (16 miles completed, 20 more surveyed), and the Council and Fish River (5 miles). Besides these a number of others are surveyed (1905) or in construction. During dry weather freighting by wagon is feasible over much of the Seward Peninsula, but rains render the tundra almost impassable. Throughout the interior most of the freighting is done in winter, as there are no wagon roads. By statute enacted in 1904 the money received from licenses outside of incorporated towns (except 25 per cent. to be used for schools) is devoted to the construction of highways under the supervision of the War Department. Mail is carried by water in summer, and by dog teams (first class mail only) in winter. Nome receives mail about four times a month, which in winter is two months in transit from Seattle. The same holds true of the inland districts, the winter mail being carried to Fairbanks from Valdes. Skagway, Juneau, Sitka, Valdes, Seward, and Seattle are connected by military cable. An overland military telegraph line connects Valdes, Eagle, Fairbanks, Rampart, and St. Michael. St. Michael and Nome are connected by wireless telegraph. The overland lines are difficult to maintain, and the service is often interrupted.

COMMERCE. As has been indicated, Alaska's chief industries are mining and fishing, next to which comes the fur trade. Lumbering is only a local industry. There is an abundance of wood suitable for pulp, but no use has been made of it. Agricultural resources are practically undeveloped, the census of 1900 showing only 159 acres of farming land. The fur trade is declining rapidly, and some districts no longer yield skins enough for local use. In 1905 the merchandise trade of Alaska with the United States amounted to $23,657,873 as compared with $22,096,015 in 1904. Of the 1905 total $14,295,346 represented imports from the United States and $9,362,527 exports to the United States. The principal imports from the United States were iron and steel manufactures, provisions, spirits, wines, and liquors, wool manufactures, and tobacco (cigars and cigarettes). Salmon is the leading merchandise export to the United States, its value in 1905 being $6,736,693, a figure considerably less than that of 1904. Gold is not classed as merchandise, but it constitutes the principal export item. Accurate figures as to the amount of gold shipped to the United States are, however, not obtainable. The merchandise trade with countries other than the United States in 1905 was valued at $2,161,103, and in 1904, $2,412,425. Of the 1905 total, exports amounted to $1,084,402 and imports, $1,076,701. Almost the entire foreign trade is with Canada. It is estimated that the product of all Alaskan industries from 1867 to 1905 had a value of $231,000,000.

POPULATION. In 1900 the population of Alaska was 63,592. The natives belong to four groups: the Esquimaux, the Aleut, the Thlinkit, and the Athabaskan. The Esquimaux inhabit all the northern part of the Territory, including the area tributary to the Arctic Ocean and the eastern shore of Bering Sea. Tribes closely related to Esquimaux are found along the eastern shore of the Alaska Peninsula, Kodiak Island, and as far east as the Copper River delta. They are essentially a docile, industrious people whose food before the coming of the white man was chiefly fish, walrus, and seal, together with caribou in some districts. They are skilled in carving and are excellent boatmen. The Aleut, closely related to Esquimaux, are found only on the Aleutian Islands and adjacent mainland. They also are excellent boatmen, and are renowned as hunters of the sea otter, an animal exceedingly difficult to approach. The Thlinkits and the closely related tribe called Haidas are confined to the Panhandle. At the coming of the Russians they were the most civilized of the native tribes, and also the most warlike. They lived in well-built log houses and had an organized tribal system. They are skilled craftsmen, and are of far greater intelligence than any of the other aborigines. The Athabaskans (the same stock as the North American Indian) dwell in the interior, reaching the coast only at Cook Inlet. They are a race of hunters, but those dwelling on the larger rivers also use salmon. With the exception of some of the isolated Esquimaux tribes, they are to-day the least civilized of Alaskan natives. Only the coastal natives appear to have any definite tribal organization; the rest are grouped rather by families. Tribal organization has never been recognized by the United States Government, which has paid small heed to its Alaskan wards. In many parts of the Territory the diminution of the natural food supplies will soon work a serious hardship on the natives. The native (aborigines) population in 1900 was 29,536 (including 2499 mixed bloods); in 1890 25,354 (including 1823 mixed bloods). The white population was 30,493 in 1900, compared to 4298 in 1890 and 430 in 1880. About one-third of this number dwells in southeastern Alaska, and about one-fifth in the Seward Peninsula. Only 19.9 per cent. of the population is of foreign birth. The largest settlements with their estimated population in 1905 were Juneau (3000), the capital and an important mining centre; Skagway (1500), the coastal terminus of the Yukon White Pass Railway; Nome (3000), the commercial centre of the Seward Peninsula; Sitka (1150), the former capital; and Fairbanks (3000) on the Tanana. Ketchikan in southeastern Alaska, Valdes on Prince William Sound, and Seward, the coastal terminus of the Alaskan Central Railway, each has a population of about 1000 and is growing rapidly. United States Army posts are maintained at Fort William H. Seward (near Skagway), Fort Egbert (Eagle), Fort Gibbon (mouth of the Tanana), St. Michael, Fort Liscum (near Valdes), and Fort Davis (near Nome).

MISSIONS. Christianity came to Alaska through the Greek Catholic missionaries in the early days of the Russian occupation. Wherever the Russians established their trading-posts the natives became converts to the Greek Catholic faith. Many of the Aleuts and the natives of the Alaska Peninsula, Kodiak Island, and the vicinity of Sitka still belong to this church, which maintains missions at a dozen localities. Soon after the transfer to the United States missionaries of other sects went to Alaska and established churches and missions. Now nearly every Christian sect is represented at one or more localities. Besides the Greek Church, the Roman Catholics, Episcopalians, Presbyterians, and Congregationalists have the most missions. Probably all of the Alaskan natives are adherents of some Christian sect, though those of the more isolated regions may not visit a mission more than once in two years. Churches for whites of various sects have been established in all of the larger settlements, and many of the clergy have done excellent work in the establishment of hospitals.

EDUCATION. Previous to 1900 all schools were supported by an appropriation disbursed by the United States commissioner of education. Since that year a part of the money raised by taxes has been devoted to educational purposes. By statute enacted in 1905 25 per cent. of all the money derived from the license taxes outside of incorporated towns was set aside for schools for white children, to be expended under the direction of the governor. This fund has proved entirely inadequate, and many small communities have had no schools. The schools within incorporated towns were continued at the expense and under the control of the municipalities. Difficulties have arisen because of the law, "Children of mixed blood who lead civilized life shall be admitted to white schools." The act of 1905 left the native schools in control of a commissioner of education, with an appropriation of $50,000. Though a score or more schools are maintained, some 4000 native children are said to be out of reach of educational facilities. Most of the native schools are at the mission stations and are more or less under the control of the missionaries of various sects. The attempt made in a few localities at industrial education of the natives has met with little success. Exception should be made of the native colony at Metlakatla on Annette Island, which under the able tutelage of Mr. William Duncan has been a self-supporting industrial community.

GOVERNMENT. Alaska is a district, or unorganized territory, there being no local legislative body. All its laws are made by the Congress of the United States. The administrative and judicial officers appointed by the President include a governor, a surveyor-general (*ex officio* lieutenant-governor and secretary of the Territory), three judges, three district attorneys, three marshals, and several deputy marshals. In 1900 Alaska was divided into three judicial districts with courts at Juneau, Eagle, and Nome. Each judge is authorized to appoint commissioners to act as justices of the peace, recorders, probate judges, coroners, commissioners of deeds, and superintendents of highways. Towns with a population of 300 or more are allowed to incorporate and elect governing bodies, but otherwise there is no local government. Under a law passed in 1906 Alaska is represented in Congress by a delegate elected by male residents of a year or more in the Territory. A complete criminal and civil code was first enacted for Alaska in 1899-1900, and has been amended from time to time. In 1900 the mineral land laws were extended to Alaska, and in 1904 a law permitting the taking up of coal lands. The seat of government was located at Sitka until 1906, when it was removed to Juneau. Alaska forms a collection district in charge of a customs collector stationed at Sitka, with 13 deputies distributed among the various ports of entry. Alaskan communities have as a rule been law-abiding. The administration of the civil code, especially as regards the pre-emption of mineral claims has left much to be desired. There is no land tax in Alaska, except within incorporated towns, but by system of license fees some $400,000 is raised annually. From 1869 to 1904 the total receipts from direct taxes and miscellaneous sources were about $10,200,000, and the total expenditure (including the cost of federal courts, administrative officers, etc.) about $8,800,000.

HISTORY. The evidence of old maps shows that something was known of the Alaskan coast as early as 1579, but it was not until 1711 that Popof, a Cossack who visited East Cape (Siberia), brought back definite knowledge of Bering Strait and the continent said by the natives to lie beyond. Vitus Bering, sent out by Peter the Great, sailed through Bering Strait in 1728; and in 1731, Gwosdef, a Cossack, was blown on to the Alaskan Coast, on which he was probably the first Russian to land. Another expedition led by Bering sighted the Alaskan Coast at Mount St. Elias July 18, 1741, and landed on Kayak Island. Chirikoff, in command of Bering's second ship, reached Cross Sound on July 15, but made no landing. Bering, returning along the Aleutian chain, discovered a number of islands and finally was wrecked on Commander Island. During the succeeding half century the Aleutian Islands were explored and exploited by the Siberian fur hunters, who reached the Alaska Peninsula about 1761. Within the next century exploration gradually advanced from three directions: the Russians reached it from Siberia through Bering Sea and Bering Strait; the English traders came from the east by way of the Mackenzie valley; and navigators of various nationalities approached it from the south by following the eastern shore of the Pacific. Among the most prominent of these expeditions were the Russian ones led by Synd (1767), Krenitzin (1768), Billings (1785), Kotzebue (1815), Lütke (1826); the Spanish ones led by Bodega y Quadra (1774), Arteaga (1779), Martinez (1788), Malaspina (1791); and one French under command of Lapérouse (1785). But the most important exploration was done by Captain James Cook, of the English navy, who in 1778 surveyed almost the entire coast line between latitudes 58° and

70°. These surveys were extended by various English navigators, notably Vancouver (1793-94), Franklin (1826), Beechey (1826), and the Franklin relief expeditions (1848-53). Meanwhile the English fur traders had approached from the east, and the explorations of Mackenzie (1793), Dease and Simpson (1837), Murray (1847), and Campbell (1848) had added much to the geographic knowledge of the Territory. The Russian fur-trading interests were consolidated in 1788 into a single company, under the management of Alexander Baranof. This so-called Russian American Company by royal charter obtained a monopoly of the fur trade throughout Alaska, and held it until the transfer to the United States. The company gradually extended its field of operations: it founded Sitka (1804), St. Michael (1834), and Nulato (1841); and its employees explored the lower Kuskokwim, the Yukon as far as the Tanana, and the lower stretches of the Sushitna and Copper rivers. In 1865-66 explorations were made by Robert Kennicott, W. H. Dall, and other employees of the Western Union Telegraph Company with the object of connecting Europe with America by telegraph, but the success of the Atlantic cable led to the abandonment of the project. The Russian colonists made no attempt to develop any resources except the furs, and as these generally decreased, the country was considered less valuable. In March, 1867, by treaty negotiated by William H. Seward, Secretary of State, in spite of much opposition, Russian America was ceded to the United States for $7,200,000 in gold.

On October 18, 1867, the Russian flag was lowered from the flagstaff in front of the Governor's residence at Sitka and the United States flag hoisted amidst the booming of cannon. This was the act of formal transfer by which Russian-America became Alaska and a possession of the United States. At a number of points in southeastern Alaska and Kodiak extensive barracks were erected and occupied by United States troops, while an army officer represented the Federal Government. But ten years later all troops were withdrawn, and for a number of years the country was governed by a naval officer stationed at Sitka. Then even this control lapsed, and Alaska was left for a time in the anomalous position of being without either military or civil government. A civil government was enacted by statute in 1884, and has continued with some modifications up to the present day (see GOVERNMENT). The Alaska Commercial Company succeeded to many of the fur-trading interests of the old Russian-American Company, and as late as 1891 maintained almost a monopoly in this field. For many years after its acquisition Alaska was neglected by the Federal Government. The Coast Survey took up the systematic mapping of the shore line, but little attempt was made to explore the interior. The Yukon was mapped in 1869 by Capt. R. W. Raymond, U.S.A., who was sent to determine the approximate position of the international boundary, and thus settle the conflicting interests of American and British traders; and in 1883 by Lieutenant Frederick Schwatka. Schwatka crossed the Chilkoot Pass (called by him Perrier Pass) with a small party, and built a raft at the headwaters of the Lewes and continued down the river in this unmanageable craft, running the various rapids, to Fort Selkirk at the junction of the Pelly and Lewes. From this point on he was traversing a river which had been explored by the Western Union Telegraph agents and was already occupied by the fur traders. Schwatka continued his trip to Fort Yukon and thence to the sea.

In 1884 Lieut. W. R. Abercrombie, U.S.A., was detailed to make an exploration of the Copper River, but ascended it only a short distance. This work was taken up again in the following year by Lieut. Henry T. Allen, U.S.A., who, with four men, landed at the mouth of the Copper River in March, 1885, and made his way up that stream by boat and sled for about 300 miles; then crossed to the Tanana by way of the Suslota Pass, and, securing another boat from the natives, continued his journey to the mouth of the Tanana. With indefatigable energy Allen then, with one companion, crossed to the Koyukuk from near the mouth of the Melozi River, and explored it almost from the Arctic Circle to its junction with the Yukon. Crossing by portage from the Lower Yukon to Norton Sound, he made his way to St. Michael, whence he returned by steamer to the United States. Lieut. G. M. Stoney, U.S.N., and Lieut. J. C. Cantwell, U. S. Revenue Marine Service, explored the Noatak and the Kobuk. In 1889 J. E. McGrath and J. E. Turner located the international boundary on the Yukon and the Porcupine. The public interest aroused by the discovery of the Klondike (1897) induced Congress to make appropriation for systematic surveys and explorations by the United States Geological Survey. The Sushitna, Kuskokwim, White, and Tanana rivers were explored in 1898, and the Chandlar and Koyukuk rivers in 1899. In 1901 a United States Geological Survey party made a trip the entire length of Alaska, from the southernmost limit to Point Barrow; while another explored the headwaters of the Allen and Koyuk rivers, and followed the latter to its mouth at Kotzebue Sound. In 1902 the western front of the Aleutian Range was explored. By 1905 over one-fifth of the Territory had been surveyed and less than one-quarter remained unexplored. In the meantime settlements had rapidly increased both in the interior and along the coast. But many of those founded during the gold craze of 1897-98 were short-lived, for at that time the entire placer mining industry could not support a population of more than a few thousand. Conditions, however, were completely changed by the discovery of the Nome gold fields (see MINING), since which time Alaska has been very prosperous.

BOUNDARY DISPUTE. When the United States acquired Alaska (1867) its eastern boundary had been fixed by the terms of a treaty made between England and Russia in 1825. At the time this treaty was negotiated England made a determined effort to secure a Pacific outlet for her fur trade, which even then had reached the headwaters of westerly flowing rivers. Russia, however, maintained that the coastal strip as far south as 54° 40′ latitude was hers by right of discovery and occupation, and forced England to accede to her demands. Article III. of this treaty, delimiting the first section of the boundary, provides that it shall run from the southernmost point of Prince of Wales Island (54° 40′), ascend to the north along Portland Canal to that part of the continent where it strikes the 56th parallel, and thence follow the summit of the mountains parallel to the coast as far as the intersection with the 141st meridian, from which point the 141st meridian shall serve as the line of demarcation between Russian and British possessions. It provided, furthermore, that whenever the summit of the mountains (north of 56° lat.) shall prove to be more than 10 marine leagues from the ocean, the boundary shall consist of a line parallel to the windings of the coast and never exceeding 10 marine leagues therefrom. For upwards of 50 years this delimitation of the boundary appears to have satisfied England and Russia and the United States, for no question was raised regarding it. In 1835 the Hudson's Bay Company attempted to establish itself in what is now southeastern Alaska, but was promptly ejected by the Russian authorities and received no support from England. The conflict between the two rival fur-trading interests was settled by the Hudson's Bay Company leasing a strip of the mainland. That part of the boundary which followed the 141st meridian (north of Mount St. Elias) was absolutely fixed, but to the south the line was less easily defined. As there was no well defined range of mountains running parallel to the coast, it was generally conceded that the line should lie everywhere 10 marine leagues from tidewater following the sinuosities of the coast, and it was thus indicated on all British and American maps up to about 1885. Meanwhile, the discoveries of gold in the inland region made an outlet to the coast all-important to the Canadians. They claimed that the 10 marine leagues should not be measured from the actual shore line, but from a line connecting headland to headland, and even went so far as to state that the boundary should not follow Portland Canal but Clarence Strait. If this claim had been recognized it would have thrown into Canada the heads of the longer fiords, as well as several of the southern islands (Revillagigedo, Gravina, etc.) of the archipelago. It would have given the Canadians a seaport on Lynn Canal and left the United States with a series of narrow, broken strips of mainland. When this contention was officially put forth in 1888 surveys of the disputed strip of territory were undertaken by mutual agreement. Thus matters went on, until the discovery of the Klondike gold fields (1896) brought the affair to an issue. The people of Alaska were justly indignant that the dispute was not settled. In a number of instances the local officers came to clash within the disputed territory. On January 24, 1903, a treaty was signed between the United States and Great Britain creating the Alaska Boundary Tribunal, to consist of six impartial jurists, three from each country to settle the dispute. Henry Cabot Lodge, Elihu Root, and George Turner represented the United States, while Richard Everard Alverston, Lord Chief Justice of England, and Louis Amable Jetté and Allen Bristol Aylesworth, Canadians, represented Great Britain. The tribunal met in London on September 3, 1903, and on October 20 a decision was reached by a majority, the United States representatives and Lord Alverston voting against the two Canadians, which was an almost complete vindication of the United States contention, though the actual demarcation of the boundary threw about one-third of the disputed area into Canada. By this decision the Canadians were finally shut off from the sea-coast north of 54° 40′. The larger entrance to Portland Canal was given to Canada and the boundary established through Pearse Canal.

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ALASKA SA′BLE. See SKUNK.

ALASSIO, ȧ-läs′syô. A seaport of Italy on the Gulf of Genoa, 57 miles southwest of the city of Genoa (Map: Italy, C 3). In winter it is frequented by foreigners, particularly by English-speaking people; and in summer the excellent bathing attracts Italians. The natives are mostly fishermen and boat builders. Pop., 1901, 5630. Consult Scheer's *Alassio und seine Umgebung* (Weisbaden, 1886).

ALAS′TOR (Gk. Ἀλάστωρ). (1) An avenging, haunting spirit. Among the Greeks the name was sometimes applied to Zeus as an avenging deity; also to the Furies. In the Middle Ages it was given to one of Satan's chief ministers, a demon supposed to execute his purposes.

(2) A poem by Shelley published in 1816, entitled in full, *Alastor, or the Spirit of Solitude.*

ALATAU, ä′lȧ-tou′ (Turk., Mottled Mountain Range). A name given to a range of lofty mountains forming the boundary between Turkestan and Mongolia and the northern limit of the great tableland of Central Asia (Map: Asia, G 4). It is made up of three sierra-like subranges, the Dzungarian, the Trans-Ili, and the Kuznets Alatau. These are all grouped around Lake Issik-Kul as a central point. The peaks of the Alatau, which are principally of granitic formation, attain an elevation of over 15,000 feet.

AL'ATER'NUS (Lat.). A genus of plants of the natural order Rhamnaceæ, akin to Rhamnus (see Buckthorn), but more generally regarded as a sub-genus of Rhamnus. It consists of evergreen shrubs, of which the best known is Alaternus phillyrea or Rhamnus alaternus, a large shrub, densely branched, with shining alternate, more or less ovate, leaves. The flowers are diœcious, racemed, numerous, and small, much sought after by bees. This shrub is abundant in Europe. The berries partake of the purgative qualities attributed to Rhamnus cathartica.

ALATRI, ȧ-lä'trė. An episcopal city in south Italy, nine miles north of Frosinone (Map: Italy, H 6). The Cyclopean gateway and walls of the ancient aletrium are splendidly preserved. It has many cloth factories. Pop., 1901, 15,322.

ALATYR, ä'lȧ-tēr'. The chief town of a district in the government of Simbirsk, Russia, on the Sura, 107 miles northwest of Simbirsk (Map: Russia, G 4). It has two cathedrals, four monasteries, a hospital, schools, etc. Milling, brewing, and brick-making are the principal industries. Pop., 1897, 11,100. It was founded in 1552 by Ivan the Terrible.

ALAUSÍ, ä'lou-sē'. A town on the Alausí River, in the province of Chimborazo, Ecuador, 75 miles east of Guayaquil (Map: Ecuador, B 4). It is situated on a plateau of the Andes, in a fertile region, abounding in hot springs. Pop., 6200.

ALAUX, ȧ'lō', Jean, called le Romain (1786-1864). A French historical painter, born at Bordeaux. He was a pupil of Vincent and Guérin, and in 1815 won the Grand Prix de Rome. He was director of the French Academy at Rome from 1846 to 1853, and in 1851 was elected a member of the Institute. His works include "Pandora Brought from Heaven by Mercury" (Palace of St. Cloud, destroyed 1870), "Burial of Our Lord" (Notre Dame de Loretto, Paris), and twenty-nine canvases in the museum of Versailles.

ALAVA, ä'lȧ-vä, Don Miguel Ricardo de (1771-1843). A Spanish general. He was born at Vittoria, Spain, and died at Barèges, France. Sprung from a noble family, he entered the navy in early life, but changed later to the land service. His political conscience was as flexible as his political career was checkered. He abandoned Ferdinand VII. for the French in 1808; left the French for the English, in 1811, and entered once more into the service of Ferdinand, in 1815, as minister to The Hague. In 1820, he was leader of the Liberals in the Cortes; in 1822 he fought against Ferdinand's guards at Madrid, and the next year he negotiated with the Duc d'Angoulême for the restoration of Ferdinand to his throne. Fearing Ferdinand's vengeance, however, Alava fled the country. From his exile in England he was recalled by Maria Christina, who made him ambassador, first to London, in 1834, and, in 1835, to Paris. The following year he refused to swear to the constitution of 1812, reëstablished by the insurrection of La Granja, and retired to France.

ALAY, ȧ-lī'. A Turkish ceremony on the assembling of the forces at the breaking out of a war, the chief feature of which is a public display of the sacred standard of Mohammed, which may be looked upon only by Moslems and touched only by emirs. It is a capital offense for a Christian to look upon the banner.

ALB. See Costume, Ecclesiastical.

ALBA, äl'bȧ (ancient Lat. *Alba Pompeia*, White Pompeia). An episcopal city of north Italy, situated on the right bank of the Tanaro, 31 miles southeast of Turin (Map: Italy, C 3). The vast Gothic cathedral dates from 1486, and there are rich collections of ancient manuscripts, coins, vases, and household utensils. The country produces wine, grain, cattle, silk, truffles, and cheese. Pop., 1901, 12,800.

ALBA, äl'bȧ. See Alva.

ALBACETE, äl'bȧ-thā'tȧ. A town of Spain, capital of the province of the same name, in Murcia. It is situated at an altitude of more than 3800 feet; 138 miles southeast of Madrid, and on the railway which runs from Madrid to Alicante (Map: Spain, E 3). It stands in a fertile but treeless plain; consists of an upper and a lower town, the latter of which, being modern, is built with some degree of regularity, and contains a number of squares and many good houses. It is a place of considerable trade, and is noted in Spain for the manufacture of knives and other steel goods. Annual cattle fairs are held here. Pop., 1887, 20,700; 1900, 21,373.

AL'BACORE, or **AL'BICORE** (Portug. and Sp. *albacora*, from Ar. *al*, the + *bakr*, a young camel, a heifer). A tunny, especially the long-finned, or alalonga. See Tunny.

AL'BA LON'GA. An ancient town of Latium, founded, according to the popular account (Livy i : 3), by Ascanius, son of Æneas, on a ridge overlooking the Alban Lake. Here lived several generations of kings, and here were born the twins Romulus and Remus, sons of the King's daughter, Rhea Silvia, by the god Mars. Alba Longa was destroyed under Tullus Hostilius, third king of Rome, and never rebuilt, its inhabitants being removed to Rome. The legend, in its general outline, is doubtless based on facts. In 1817 a remarkable pre-historic necropolis was found here, buried under volcanic ashes, and containing burial-urns in the form of round huts. (See Archæology.) The site of the town seems to have been near the modern Castel Gandolfo. The Emperor Domitian had a villa here.

ALBAN, a̤l'ban, Saint. According to legend, the first martyr of Britain. He was born at Verulam in the third century, and after having long lived as a heathen, was converted to Christianity, but put to death in 304. His day is June 22. The town of St. Albans, which bears his name, is believed to stand on the site of his birthplace or the scene of his martyrdom. See St. Albans.

ALBA'NI. In ancient times, a people in Asia inhabiting the country between the Caucasus and the Cyrus River, and between Armenia and the Caspian Sea, corresponding with the modern Shirvan and southern Daghestan. The ancient Albanians were described as tall, strong, and of graceful appearance. They were nomads. A Roman army under Pompey first encountered them in 65 b.c., and found a force of 60,000 infantry and 22,000 cavalry opposing it. Pompey secured a nominal submission, but they continued practically independent.

ALBANI, ȧl-bä'nė. A rich and celebrated family of Rome, who came originally from Albania in the sixteenth century and settled first at Urbino. The great influence of the family dates from the accession (1700) of Giovanni Francesco Albani to the papal throne as Clement XI. It has since furnished a succession of cardinals. Cardinal Alessandro Albani (q.v.) made the celebrated art collection of the Villa Albani at Rome.

ALBANI, Alessandro (1692-1779). A nephew of Pope Clement XI., created cardinal by Innocent XIII. in 1721. He was born at Urbino, and was a brother of Annibale Albani. Under Maria Theresa, he served as minister at the papal court and crown-protector of Austria. After his death his collection (at Rome) of statues and other works of art was bought by George III.

ALBANI, Emma (1851—). The stage name of Marie Louise Cecilia Emma Lajeunesse. A Canadian dramatic soprano. She was born at Chambly, near Montreal, November 1, 1851. She made her first public appearance at Albany, N. Y., when but twelve years old. She studied under Duprez, of Paris, and Lamperti, of Milan, made her *début* at Messina as Amina in *La Sonnambula* (1870), and has sung in opera in London, Paris, Berlin, St. Petersburg, and many cities of the United States. Among her impersonations are: Senta in the *Flying Dutchman*, Elisabeth in *Tannhäuser*, Elsa in *Lohengrin*, Marguerite, Lucia, Mignon, Ophelia, and Isolde. Madame Albani has also sung in oratorio. She married Ernest Gye, the impresario, in 1878. Consult H. S. Edwards, *The Prima Donna* (London, 1888).

ALBANI, Francesco (1578-1660). An Italian painter of the Carracci School, the lifelong friend of Guido Reni. He was born and lived chiefly at Bologna. He leaned to the classical in subject, and although he was styled the Anacreon of painting, his manner was far removed from the dignified simplicity of Greek art. His figures were charming and graceful, but were gay and sportive rather than dignified. Albani opened an academy in Rome, and it is in that city that the chief memorials of his works are to be found. By a second marriage he became the father of twelve children, all of whom were so beautiful that they served as models for his most famous paintings. Among his chief works are the frescoes of scenes from Ovid in the Torlonia Palace and "Four Seasons" in the Borghese Gallery, Rome; "Cupids Dancing" and ten others at Dresden; "Cupids Disarmed," "The Toilette of Venus," and thirteen others in the Louvre.

ALBANI, Matthias. The name of two famous Tyrolese violin makers, father and son. The father was born in 1621 at Bozen. He was a pupil of Stainer. He died in 1673. The son studied with the masters of violin making at Cremona, and afterward settled at Rome. The instruments he made between the years 1702 and 1709 are exceedingly valuable, and are by some considered equal to those of Amati.

ALBANI, Villa. The palace of the Albani family at Rome, containing a famous collection of antique works of art.

ALBANIA, ăl-bā′nĭ-ȧ; *Mod. Gk.* äl′bȧ-nē′ȧ (Turk. *Arnaut*). A country in the western part of the Balkan Peninsula, embracing, in the widest sense of the name, the Turkish vilayets of Janina, Monastir, Scutari, and a part of Kossovo (Map: Turkey in Europe, C 4). It takes in ancient Illyria, most of Epirus, and parts of Macedonia, and covers an area estimated at from 12,000 to 22,000 square miles, according as the name is taken in a narrower or broader sense. It borders on Montenegro and the Sanjak of Novibazar on the north, Macedonia on the east, Greece on the south, and the Adriatic Sea on the west. The whole region is traversed by numerous high mountain chains, separated by long and narrow valleys, running from northwest to southeast. The elevated plateaus found among the mountain chains are mostly fruitful and well populated, and some of them inclose lakes. The rivers of Albania, of which the most important are the Boyana, Drin, Devol, and Voyussa, have an exceedingly tortuous course, on account of the mountainous character of the surface. The climate is healthful and moderate, and the soil for the most part fertile. Grain and tobacco grow well, and the olive is cultivated extensively and exported on a considerable scale. Some fish and sea salt are also exported. The population of Albania, within the broader limits given above, is probably not far from 2,000,000, but Albania proper, or the region which is inhabited mainly by Albanians, has a much smaller population (less than 1,000,000). The Albanians, or Arnauts, who call themselves Shkipetars (Skipetars), are the descendants of the ancient Illyrians, and occupy a unique position among the Caucasian races. Only slightly civilized and very warlike, they keep the country in a constant state of turmoil. The differences in religion of the various tribes, their strong feeling of clanship, together with the warlike spirit of the people, afford ample opportunity for civil strife. In their form of government the Albanians still retain some of the patriarchal institutions, and Turkish authority is only slightly recognized. The Mohammedan religion is professed by most of them, while the Christians number 190,000, divided almost equally between Roman and Greek Catholics. There are nearly 200,000 Albanians in Greece, found chiefly in Attica, Megaris, and the islands of the Ægean; about 100,000 in southern Italy, and smaller groups in the Slavonic provinces of southern Austria. The turbulent tribes which inhabited the region in antiquity resisted all attempts at subjugation, and except during the reign of Pyrrhus of Epirus (296-272 B.C.) never acknowledged any supreme authority. In the Middle Ages the inhabitants displayed the same obstinacy in their resistance to the Turkish power. Their great leader, George Castriota, or Scanderbeg (1404-68), overwhelmed twenty-three Ottoman armies, some of them commanded by the sultan in person, and though after the fall of Scutari, in 1478, the nominal authority of the Porte was acknowledged, the country at all times enjoyed a very large measure of freedom. From 1807 to 1822 Albania was practically independent under the rule of Ali Pasha (q.v.), the Lion of Janina. The feeling of inveterate hostility for the Greeks kept the Albanians from embracing their cause in the war of liberation. Consult: H. Callan, "Albania and the Albanians," in *Scottish Geographical Magazine*, Volume XV. (Edinburgh, 1899); P. Traeger, "Mittheilungen und Funde aus Albanien," in *Zeitschrift für Ethnologie*, Volume XXXII. (Berlin, 1900).

ALBA′NIAN LAN′GUAGE. The Albanian

forms one of the eight chief divisions of the Indo-Germanic languages (q.v.), and is a descendant of the ancient Illyrian, of which only a few words are preserved. On account of the large number of Greek loan-words in its vocabulary, the Albanian was formerly thought to belong to the Hellenic branch of dialects; but it is now known to be quite independent, and to form a branch by itself, akin rather to the Slavic family than to the Greek group. Geographically, the language is not confined to Albania alone, but may be traced also in southern Italy and Sicily. Two main dialect-groups of the language may be distinguished. The northern class, called Gegish, is the more primitive, while the southern, or Toskish, is permeated with loan-words. Of all the languages of the Indo-Germanic group, Albanian has been the most changed in vocabulary by borrowed words, although it has preserved in the main its structure. The vocabulary of loan-words is chiefly Latin, augmented by Slavic and Greek accretions, and, in Gegish especially, by numerous Turkish words. In point of literary culture Albanian is the most backward of all the Indo-Germanic languages, and it can scarcely be said to possess a literature. While rich in folk-songs, tales, and proverbs, it is only within a comparatively short time that any systematic endeavor has been made to cultivate the literary potentialities of the people. In the Gegish dialects the alphabet usually employed is the Roman, with certain modifications, while the Toskish adopts the Greek letters with some slight changes. Consult: Pisko, *Kurzgefasstes Handbuch der nordalbanesischen Sprachen* (Vienna, 1896); Dozon, *Manuel de la langue chkipe ou Albanaise* (Paris, 1878); G. Meyer, *Kurzgefasste albanesische Grammatik* (Leipzig, 1888); *Etymologisches Wörterbuch der albanesischen Sprache* (Strassburg, 1891); Pedersen, *Albanesische Texte* (Leipzig, 1895).

ALBAN (ăl'ban) **MOUN'TAINS.** A group of volcanic mountains in central Italy, 13 miles southeast of Rome, with several extinct craters, two of which are occupied by sombre Lake Albano and beautiful Lake Nemi (Map: Italy, G 6). The central crater terminates in Punta Faette and in Monte Cavo, 3145 feet above the sea, on which stood the temple of Jupiter Latiaris, where the sacrificial festival of the Feriæ Latinæ was celebrated annually. The scanty ruins of the temple disappeared about 1777, when Cardinal York, the last of the Stuarts, built on the spot a Passionist monastery. From here there is a splendid view of the sea, the Campagna, and the surrounding mountains. The beauty of the scenery and the agreeableness of the climate have made the Alban Mountains a favorite summer resort of the Romans from the most ancient times. Places that are worthy of a visit by the tourist are Frascati (q.v.), Albano, Grotta Ferrata, Marino, Castel Gandolfo (q.v.), and Rocco di Papa. The site of Alba Longa (q.v.), Rome's mother city, was on the east side of Lake Albano.

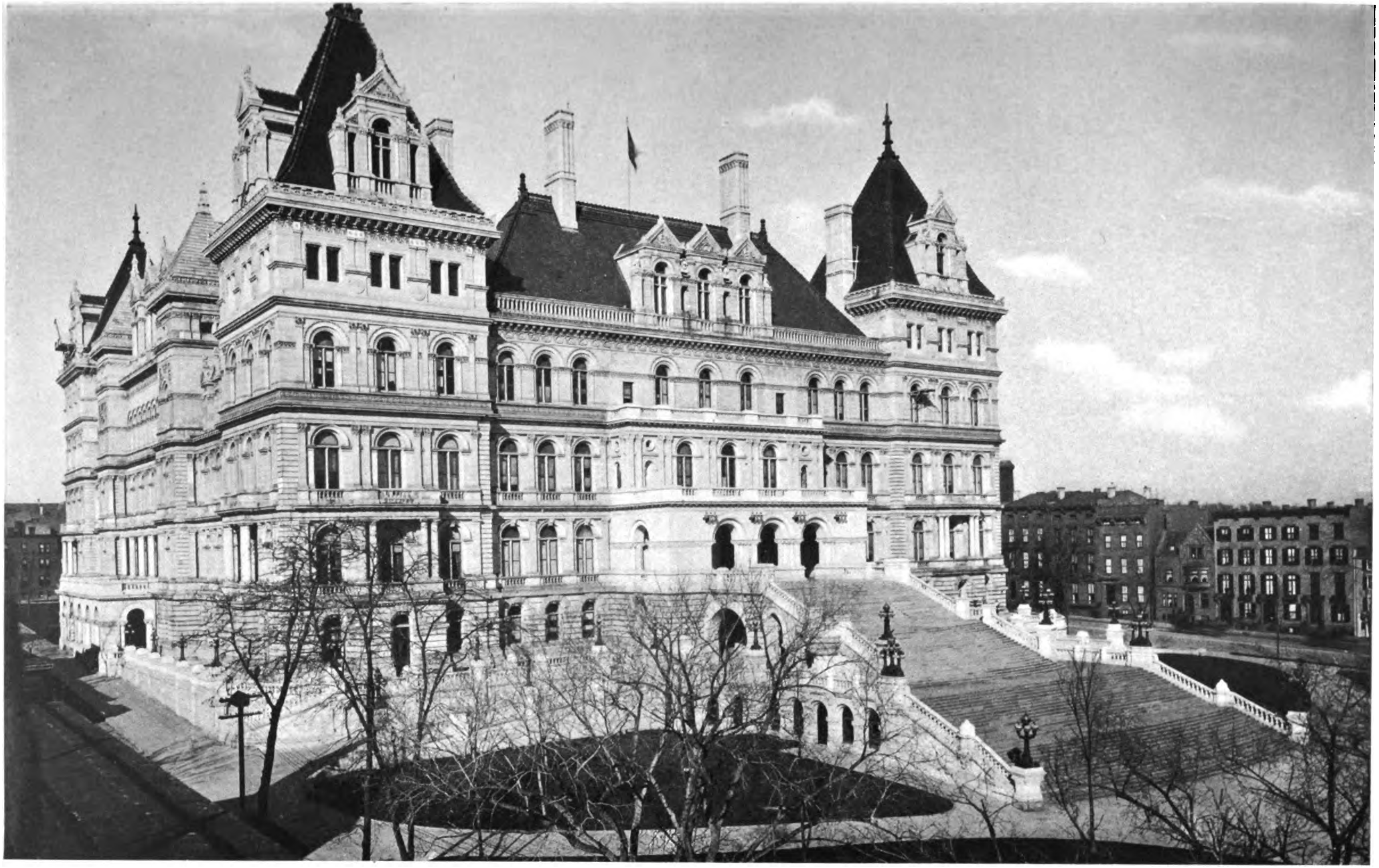
ALBANO, ȧl-bä'nō. A town of Italy, about 18 miles from Rome, on the declivity of the lava-walls which encompass Lake Albano (Map: Italy, G 6). It is the seat of a bishop, had, in 1901, 8461 inhabitants, and is surrounded by handsome mansions of the wealthier Romans. The town is celebrated for the beauty of its scenery and the purity of its air. It is on the opposite side of the lake from the site of Alba Longa, and owed its origin to the villas of ancient Roman magnates, such as Pompey, Domitian, and Clodius, which are replaced in our own times by the villas of the princely families of the Barberini, Altieri, and others. There is also a large convent, and a museum of antiquities from Alba Longa. A valuable wine is produced in the environs. Near the town, on the old Appian Way, are found the remains of an amphitheatre and ancient tombs. A notable modern structure is the viaduct passing over the deep valley between Albano and the little town of Ariccia. It is 182 feet high, 988 feet long, and was erected by Bertolini during 1846-53. The Alban Lake, or Lago di Castello, is formed in the basin of an extinct volcano, has a circumference of 6 miles, with a depth of about 560 feet. It abounds in fish, and is famous for the beauty of its scenery. Its elevation is nearly 1000 feet above the sea level. Ancient writers say that, while the Romans were at war with the Veientes (398 B.C.), this lake rose to an extraordinary height in the heat of summer. Etruscan diviners declared that the conquest of Veii depended upon letting off the waters of the lake. Stimulated by this, the Romans, under the direction of the Etruscans, opened an emissary or tunnel through the lava wall on the northwest. In the execution of this work they acquired the art of mining, which they now applied to undermine the walls of Veii. The tunnel, which still remains, and still fulfills its ancient office, is more than a mile in length, with a height of 7 feet and a width of 4 feet. It is the only outlet for the waters of the lake. On the eastern bank of the lake rises Monte Cavo, the ancient Albanus Mons, 3000 feet high, which commands an extensive and magnificent view. Upon its summit once stood the magnificent temple of Jupiter Latiaris, which was approached by a paved way, for the ascent of the solemn processions of the Latin confederation (*Feriæ Latinæ*), and for the ovations of Roman generals. The road remains, in great part, perfect to this day. The Albano stone, called peperino, was much used in Roman buildings. It is a kind of volcanic tufa, of an ash-color, and is still quarried extensively at Albano.

ALBANS, ạl'banz, ST. See ST. ALBANS.

ALBANY, ạl'bȧ-nĭ. A fortified seaport and municipality of Plantagenet Co., Western Australia, on King George's Sound, 352 miles from Perth by rail (Map: Australia, B 5). It has one of the finest harbors in Australia and is a port of call for all steamers to Australia taking the Cape route. Its equable climate has made it the health resort of the State. The United States has a resident consular agent. Pop. (1901), 3650.

ALBANY. Capital of New York State, and county seat of Albany Co., and an important railroad and commercial city. It is on the west bank of the Hudson River, nearly six miles below the head of navigation, 145 miles north of New York City and about 200 miles west of Boston (Map: New York, G 3).

A narrow alluvial plain extends along the river, and from this the ground rises sharply to a sandy plateau about two hundred feet above tide level, with valleys separating the four ridges into which the slope is divided. The principal streets are Broadway, and North and South Pearl streets, which run parallel to the river, and State Street, which runs westward, ascending the face of the hill at a very steep grade. The



THE CAPITOL AT ALBANY

most striking feature as well as the most important edifice in Albany is the Capitol, which is built of Maine granite, in the Renaissance style. Since its corner-stone was laid, in 1871, it has cost over twenty-four million dollars. The edifice has been built with the advantage of large ideas and limitless resources, and the disadvantages of a succession of architects with changing views; these circumstances have left their imprint on the structure. But when all has been said in criticism of details, the general plan, and unused possibilities, it must be ranked among the great buildings of the country. Within are rooms for the Assembly, Senate, Court of Appeals, the State Library of over 500,000 volumes, the governor, and other State officials. Many relics of the Revolution and Civil War find place in its spacious corridors. Facing the Capitol are the State Hall, and the city hall, of red sandstone, with Romanesque doorways and majestic campaniles. The Federal building, containing the custom house and post office, is at the foot of State Street, and on the same avenue, about a block below the Capitol, is the State Museum of Natural History. In the residence districts, the most important architectural features are the churches, four of which have more than a local interest: The North Dutch church, St. Peter's Church, "one of the richest specimens of French Gothic in this country," the cathedral of All Saints, and the cathedral of the Immaculate Conception, with lofty double spires and a spacious interior treated with taste and dignity.

Other important buildings are the new Union Station, the Hotel Ten Eyck, the Albany Academy, Harmanus Bleecker Hall, and the State Arsenal. The second Van Rensselaer manor house, built in 1765, was removed in 1893 to the campus of Williams College at Williamstown, Mass. The old Schuyler mansion is now used as an orphan asylum by the Sisters of Charity. Albany is the seat of a State normal college, and contains the law and medical departments of Union University at Schenectady, and also Dudley Observatory, in the southwest corner of the city. Near the latter are the pavilions of the new hospital, built in 1899; and in the same section is the County penitentiary, opened in 1848, which confines annually between 300 and 400 prisoners, the majority sentenced for short terms.

The city has 470 acres devoted to parks, the largest of which, Washington Park, in the western part of the city, contains a lake 1700 feet long, and two fine bronzes: Calverley's statue of "Robert Burns," and Rhind's statue of "Moses at the Rock of Horeb." In the beautiful Rural Cemetery about four miles north of the city is the tomb of President Arthur.

Trade and Transportation. Albany is a terminus of the Boston and Albany railroad, and the division terminus on the main lines of the West Shore, the New York Central and Hudson River and the Delaware and Hudson railroads. It is thus at the intersection of the great thoroughfares of traffic and travel from Boston and New York to the west and the north It also has direct steamboat communication by day and night lines with New York and Hudson River points, while by the Erie and the Champlain canals it has water routes to the interior of the State and the west and north. It still remains an important centre of passenger travel, but the great bulk of freight movement now passes the city in through shipments. Manufacturing interests in Albany have increased considerably during the last ten years. The most important industries now include iron, wood, and brass manufactures; printing and engraving; shirt, collar, and cuff manufactures; manufactures of clothing, caps, and knit goods; brewing; tobacco and cigar manufactures; and carriage and wagon building.

The city has about 28 miles of street railways, and electric lines connect also with towns some distance away. There are three bridges across the river to Rensselaer, two of which are used by the railroads and foot passengers, and the third is open for foot and wagon traffic. The water supply is furnished in part by a gravity supply, from a lake five miles distant; but a large proportion is pumped from the Hudson River, an improved filtration system having recently been adopted for the latter supply. There are about 100 miles of paved thoroughfares, some of which are laid with asphalt and brick, though most of the important streets are paved with granite blocks and many still have cobblestone pavements.

Administration. As provided by legislative enactment for cities of the second class, the government is vested in a mayor, elected biennially; a city council, the president being elected at large and the aldermen by wards; and administrative departments constituted as follows: *Finance*—comptroller, treasurer, and a board of estimate composed of the mayor, comptroller, corporation counsel, president of the common council, city engineer, and treasurer; *Public Works*—commissioner, who appoints superintendents of water works and parks, city engineer; and a board of contract and supply, composed of the mayor, comptroller, commissioner of public works, corporation counsel, and city engineer; *Public Safety*—commissioner, who appoints chiefs of police and fire departments, with their subordinates, and a health officer and district health physicians; *Public Instruction*—three commissioners (term, six years), who appoint the Superintendent of Schools and teachers; *Assessment and Taxation*—four assessors, two elected every two years for a term of four years; *Charities and Correction*—commissioner, who appoints an overseer of the poor and assistants; *Judiciary*—one police court justice who holds office six years, and three city court justices; *Law*—corporation counsel, who appoints an assistant and subordinates. Of these officials, the comptroller, treasurer, assessors, and police and city court justices are elected; all others are appointed by the executive. A sealer of weights and measures is also appointed by the mayor, and supervisors are chosen by popular election.

The annual expenditures of the city amount to about $3,000,000, the principal items (for maintenance and operation) being about $175,000 for the police department, $140,000 for the fire department, $300,000 for schools, $300,000 for bureau of waters, and $90,000 for street lighting.

Pop., 1870, 69,422; 1880, 90,758; 1890, 94,923; 1900, 94,151; 1905, 98,374, including 18,312 persons of foreign birth and 987 of negro descent.

History. Albany claims to be the second oldest permanent settlement within the limits of the thirteen colonies, and has a much greater historical significance on account of its strategic importance during the century of conflict between the English and French in America and in the American Revolution. As early as 1524, the French navigator Verrazano sailed up the Hudson River, and about 1540 a French trading post was set up near the present site of Albany. But this proved only temporary, and the continuous history of the place dates from the effective discovery of the region by Henry Hudson in 1609. Hudson's voyage was followed by Dutch traders, who, in 1614, established a trading station on Castle Island under the name of Fort Nassau. Three years later, the trading post was removed to the mainland and given the name Beverwyck. The first actual settlers, however, were eighteen Walloon families, who arrived in 1624. During the same year, Fort Orange, or Aurania, was built, near the site of the present State Capitol. Two years later an Indian war broke up the settlement for a time. In 1629, Killiaen Van Rensselaer obtained an extensive grant of land in the neighborhood of Fort Orange, and sent over settlers from Holland, who rented their land from him as their patroon, or lord of the manor. (See PATROON.) On the transfer of New Netherlands to the English, in 1664, the name of Albany was given to the settlement, in honor of the Duke of York and Albany, afterward James II.; and shortly afterward a long-standing dispute as to the jurisdiction of the patroon over the earlier settlements was compromised. In 1686, Albany received a city charter from Governor Dongan, providing for an elected council and a mayor to be appointed by the governor. The first mayor, Peter Schuyler, continued to serve until 1694. The settlement continued to be inhabited mainly by the Dutch, but the increase in the English population is indicated by the erection of an English church in 1714.

As a frontier town open to Indian attacks, Albany was protected not only by the fort, but by a stockade surrounding the compactly built area. During the French and Indian wars, the city was the storehouse for munitions of war, the rendezvous for the troops, and a place of safety for refugees and wounded soldiers. In 1754 there was held at Albany the first general Congress (see ALBANY CONVENTION) of all the colonies, at which plans of union were discussed.

Burgoyne's campaign in 1777 was directed against Albany, as the key to the situation in the north; but the battle of Saratoga preserved this strategic point to the patriots. During the next twenty years Albany was at times the headquarters of the State government; in 1797 it was made the permanent capital of the State, and the first State house was built a few years later.

In 1820 Albany had a population of only 12,630; but the Erie Canal opened a new field for commercial activity, and brought a rapid development. By 1840 the population was 33,721, or nearly treble that of twenty years before; by 1860 it had reached 62,367, but since then the increase has been at a slower rate. In 1839 there began the "Anti-Rent War" (see ANTI-RENTISM), the result of an attempt by the Van Rennsselaer heirs to collect the quit-rents on the old leases made in the pre-Revolutionary days. Albany has been visited by several disastrous fires, those in 1797 and 1848 being the most destructive. The lower part of the city has often been inundated by spring floods in the river. In 1886 the bi-centennial of the incorporation of the city was celebrated with elaborate ceremonies; and on January 6, 1897, the centennial of the selection of the city as the State capital was also commemorated. In 1894 the Delavan House, for fifty years the resort of politicians and eminent men, was burned. See A. J. Weise, *The History of the City of Albany* (Albany, 1884); J. Munsell, *The Annals of Albany*, 10 volumes (Albany, 1850-59), and *Collections on the City of Albany*, 4 volumes (Albany, 1865-71); and a sketch in L. P. Powell's *Historic Towns of the Middle States* (New York, 1899).

ALBANY. A city and county seat of Linn Co., Oregon, 80 miles south by west of Portland, on the Southern Pacific and the Corvallis and Eastern railroads, and on the Willamette River (Map: Oregon, B 5). It is the seat of Albany College (Presbyterian), opened in 1867. The river, crossed here by a fine steel bridge, supplies good water power. There are wagon and furniture factories, saw and planing mills, foundries, brickyards, and woolen and flouring mills. Flour, grain, and sandstone are exported. Albany was settled about 1850, and was incorporated in 1864. Pop., 1900, 3149; 1905 (local est.), 5400.

ALBANY. A city and county seat of Dougherty Co., Ga., 107 miles south by west of Macon, on the Central of Georgia, the Atlantic Coast Line, the Seaboard Air Line, and the Albany and Northern railroads, and on the Flint River, at the head of high water navigation (Map: Georgia, B 4). It is in an agricultural region, and controls large commercial interests, particularly in cotton, cottonseed oil, bricks, fertilizers, lumber, etc. The city is the home of the Georgia Chautauqua; and is noted for numerous artesian wells, which are the exclusive source of the water supply. Settled in 1836, Albany was incorporated two years later. The government, under a charter of 1899, is administered by a mayor, elected biennially, and a council, whose consent is required for all appointments of administrative officials made by the mayor. The water-works and electric light plant are the property of the municipality. Pop., 1900, 4606; 1906 (local est.), 9500, due to extension of city limits.

ALBANY. A city and county seat of Gentry Co., Mo., 50 miles northeast of St. Joseph, on the Chicago, Burlington and Quincy Railroad (Map: Missouri, B 1). It is a residential place, with commercial and industrial interests, but is known primarily as the seat of the Northwest Missouri College (Methodist Episcopal, South), opened in 1893. It also has a public library (Carnegie). Laid out in 1845 and incorporated in 1857, Albany is governed, under a charter of 1897, by a mayor, biennially elected, and a city council. The waterworks and electric light plant are owned and operated by the municipality. Pop., 1890, 1334; 1900, 2025.

ALBANY, or AL'BAINN. An ancient name for Scotland, retained in poetical usage down to our own day. Connected with it is the term Albiones, applied to the inhabitants of the entire British Islands in Festus Avienus's account of the voyage of Hamilcar, the Carthaginian, in the fifth century B.C.; also the term Albion (q.v.), which appears as the name of the islands in Aristotle's *Treatise of the World*. It may, indeed, be assumed that Albion, or Albany, was the original name of Britain among its Celtic population, and that it only became restricted to the northwest provinces of Scotland when the Celts had for the most part become confined to the same region. The modern use of the name Albany may be said to have taken its rise in an act of a Scottish council, held at Scone, in June, 1398, when the title of Duke of Albany was conferred on the brother of King Robert III., then acting as regent of the kingdom. The title, being forfeited in the grandson of the first holder, was afterward conferred on Alexander, second son of King James II., in the person of whose son, John, it became extinct in 1536. Subsequently it was conferred on a number of princes of the royal family. Prince Charles Stuart assumed the appellation of Count of Albany as an incognito title, and gave the title of Duchess of Albany to his legitimated daughter. The title was restored in 1881 and conferred upon Prince Leopold, and after his death upon his son.

ALBANY, Duke of. See Leopold, George Duncan Albert.

ALBANY, Duke of. In Shakespeare's *King Lear* (q.v.), the husband of Lear's daughter Goneril (q.v.).

ALBANY, Louisa Maria Caroline, also Aloysia, Countess of (1753-1824). The wife of Charles Edward Stuart (q.v.), grandson of James II. of England. She was the daughter of Prince Gustavus Adolphus of Stolberg-Gedern, who fell in the battle of Leuthen in 1757. During her married life she bore the name of the Countess of Albany. She had no children, her marriage proved an unhappy one, and in order to escape from the ill-usage of her husband, who lived in a state of continual drunkenness, she sought refuge in a nunnery, 1780. At the death of the Prince, in 1788, the court of France allowed her an annual pension of 60,000 livres. She outlived the house of the Stuarts, which became extinct at the death of her brother-in-law, Cardinal York, in 1807. At Florence, where she lived for a long time, her palace was a notable resort for men famous in political and literary circles. Her name and her misfortunes have been transmitted to posterity through the works and autobiography of Alfieri (q.v.), whose mistress she was after the death of the Prince, and through the treasures of the Musée Fabre, founded by another of her lovers. Her body and that of Alfieri repose in the same tomb in the church of Santa Croce at Florence, between the tombs of Machiavelli and Michelangelo. Consult: Lee, *The Countess of Albany* (London, 1884); Reumont, *Die Gräfin von Albany* (Berlin, 1860).

ALBANY CONVENTION OF 1754. In 1754, when hostilities were about to begin between the French and English in America, the lords of trade recommended that an intercolonial convention be called to "confirm and establish the ancient friendship of the Five Nations" and consider plans for a permanent union among the colonies. On June 19, commissioners from Massachusetts, Connecticut, New Hampshire, Rhode Island, Pennsylvania, Maryland, and New York assembled at Albany, and, after arranging for the participation of the Indians in the war, adopted, with some modifications (July 11), a plan of intercolonial union proposed by Franklin. This plan provided for the appointment by the crown of a president-general, who was to nominate military officers, commission all officers, and have veto power over the acts of the Grand Council; and for a Grand Council, to be made up of representatives chosen by each colony every three years, no colony to have more than seven members nor less than two. This council was not to be prorogued, dissolved, or kept in session longer than six weeks against its consent, and, with the approval of the president-general, was to manage Indian affairs, authorize new settlements, nominate all civil officers, impose taxes, enlist and pay troops, and construct forts, all of its acts to be valid unless vetoed by the crown within three years. The plan was everywhere rejected—by the court and the royal governors, because it gave too much power to the colonies; by the colonies, because it gave too much power to the king. It is notable as being the first comprehensive scheme of union formally proposed to the various colonial governments in America. Consult: *New York Colonial Documents*, Volume VI.; and R. Frothingham, *Rise of the Republic* (Boston, 1872).

ALBANY RE'GENCY, The. A name popularly given to a group of New York Democrats living at Albany, who, from 1820 to about 1850, controlled the nominating conventions and patronage of their party within the State, and by dictating its general policy, exerted a powerful influence in national as well as State politics. They derived their power largely from their great personal influence and remarkable political sagacity, and were, for the most part, earnest opponents of political corruption, though they uniformly acted upon the principle, first formulated in 1833 by one of their number (Marcy), that "to the victors belong the spoils." Among those who at various times were members of this unofficial body were: Martin Van Buren, William L. Marcy, Silas Wright, John A. Dix, Edwin Croswell, Benjamin F. Butler, A. C. Flagg, Dean Richmond, and Samuel A. Talcott, several of whom "graduated" from it into high offices under the national government. The Regency's loss of prestige dated from about 1848, when their opponents adopted methods similar to their own, and the Democratic party in the State split into irreconcilable factions. (See Barnburners.) Consult: Alexander, *A Political History of the State of New York* (2 vols. New York, 1906); Morgan Dix, *Memoirs of John A. Dix* (New York, 1883).

AL'BATEG'NIUS. See Al-Battani.

AL'BATROSS (Corrupted from Portug. *alcatraz*, the pelican, from Ar. al, the, + *câdous*, bucket, referring to its supposedly water-carrying pouch). A popular name for the large marine birds of the family Diomedeidæ, closely related to the petrels (q.v.). Albatrosses are among the most exclusively pelagic birds known. They occur on nearly all parts of the ocean, except the north Atlantic, and even there, owing to their extraordinary powers of flight, they are occasionally seen. Like the petrels, albatrosses have the hind toe, or hallux, reduced to a mere claw,

BEAK OF AN ALBATROSS.

or entirely wanting, while the other three toes are fully webbed. The nostrils also open at the ends of nearly cylindrical, horizontal tubes, a character upon which the order Tubinares is based. Albatrosses differ from petrels, however, not only in their great size, but also in having the nostril tubes placed one on each side of the bill, at its base, instead of close together on top. The bill of an albatross is a heavy and powerful structure, four inches long or more, and strongly hooked at the tip. The covering consists of several distinct plates of horn. The plumage of the body is very thick and compact, and well adapted to withstand not only water but cold. Experiment has shown that an albatross can withstand a temperature far below freezing for weeks at a time, even when confined, so that active movement is impossible. The tail is comparatively short and more or less rounded, but the wings are exceedingly long and pointed. The great length of wing is largely due to the unusual length of the humerus and the radius and ulna. Owing to this great length of upper arm and forearm, the number of flight-feathers carried on the wing exceeds that of any other known bird, the number of secondaries being about forty. As might be supposed from their size, albatrosses are very voracious. Their food is all gathered from the surface of the sea, as they do not dive. Fishes, pelagic mollusks, and other floating animal matter, including the offal of vessels, compose the food of these birds, and they may be caught from a vessel with hook and line baited with salt pork. Their power of flight is very remarkable, and they occasionally follow vessels for days at a time. Because of this habit, and because they are almost the only visible inhabitants of the wastes of the southern oceans, sailors regard them with superstitious affection, and it is considered a forerunner of most serious misfortune to kill an albatross. This fact has passed into literature in Coleridge's *Rime of the Ancient Mariner*. The best modern description of the bird is in Froude's *Oceana*. Albatrosses seldom visit land, and then only remote antarctic islands, to breed. Often no nest is made, but the single egg is dropped on the bare earth. The egg is large and white, and somewhat ellipsoidal in shape.

The number of species of albatross is still doubtful, but it is probably not less than ten, nor more than a dozen. Of these all but two are placed in the genus *Diomedea*. The largest, and perhaps the best known, species is the wandering albatross (*Diomedea exulans*), which is found throughout the southern oceans, and occasionally strays to Europe and possibly to Florida. The plumage of the adult is chiefly white, but the larger wing-coverts and part of the back are more or less barred with black. The young are dusky, lighter on the lower parts. This species is about four feet in length, and ten to fourteen feet in extent of wings. On the Pacific coast of North America occur two species, the short-tailed (*Diomedea albatrus*) and the black-footed (*Diomedea nigripes*), both of which are said to be abundant. They are rather small for albatrosses, only three feet long and about seven feet across the wings. Another species of about the same size, widely distributed over the Pacific Ocean, is the sooty albatross (*Phœbetria fuliginosa*). These three species are easily distinguished by their color: The short-tailed albatross is white, with dark wings and tail and flesh-colored feet; the black-footed is dark chocolate brown, whitening on the head, and the feet are black; while the sooty albatross is uniform sooty-brown, with light-colored feet. The last species also has a wedge-shaped tail and a slender bill. The yellow-nosed albatross (*Diomedea chlororhyncha*), so called from the color of the bill, is a well-known southern species. All these small forms are known to sailors as 'mollymucks.' See Plate of AUKS, ALBATROSSES, etc.

AL-BATTA′NI, MOHAMMED IBN JABIR IBN SINAN, known as ALBATEGNIUS (so called from Battan in Mesopotamia) (c.850-929). An Arab chief, one of the most famous astronomers and mathematicians of his race. His first astronomical observations were made at Rakka (877-878), and extended over a period of more than forty years. He also made several important contributions to pure mathematics. He used the sine of an angle in place of the chord of double the angle (an idea that had occurred to Aryabhatta), computed a table of cotangents, and formulated certain propositions in spherical trigonometry. His astronomical works were first made generally known to European scholars through a translation by Plato of Tivoli, under the title *Mahometis Albatenii de Motu* (or *Scientia*) *Astrorum*. This work has been edited in Arabic and Latin by C. A. Nallino (Milan, 1899). Al-Battani corrected numerous errors of Ptolemy, whom, in general, he followed; e.g. he gave the obliquity of the ecliptic as 23° 35′ instead of 23° 51′ 20″. He also gave the length of the tropical year as 365 days, 5 hours, 46 minutes, 24 seconds; too short by 2 minutes, 26 seconds, but an improvement upon that of Hipparchus, who gave 365¼ days — $\frac{1}{300}$ day, which was too short by 4 minutes, 48 seconds.

ALBAUGH, ăl′bạ, JOHN W. (1837—). An American actor and manager. He was born September 30, 1837, at Baltimore, where he made his first appearance as Brutus in a play called *Brutus, or the Fall of Tarquin* (1855), on a stage managed by Joseph Jefferson. Of Mr. Albaugh's many subsequent impersonations, perhaps his best known was that of Louis XI., at what later became Daly's Theatre, in New York. Since 1868 he has been manager of theatres in St. Louis, New Orleans, and Albany, and for a number of years in Washington and Baltimore, where he owns the new Lyceum. He retired from the stage in 1899. Much of his leisure in recent years has been devoted to his noted stock farm near Washington. Consult Clapp and Edgett, *Players of the Present*, Dunlap Society, publishers (New York, 1899).

ALBAY, ȧl-bī′. A province and a town of Luzon, one of the Philippine Islands. The province takes in the southern end of the island and contains an area of 1783 square miles, and a population of 240,326 (Map: Philippine Islands, H 6). The surface bears traces of volcanic origin, and the province has several extinct volcanoes and the active volcano of Mount Mayon. It is well watered and has good roads. A considerable part is covered by thick forests, full of good timber and game. The chief city is situated near the eastern coast, on the Bay of Albay. It has a good harbor, and is the seat of a considerable trade. Pop., 1903, 14,049.

ALBE′DO (Lat. whiteness). In astronomy, the reflecting power of a planet's surface. The quantity of reflected solar light received by us from any given planet depends, of course, on the character of that planet's surface. If it were like polished silver, for instance, the albedo would be very high; much higher, indeed, than the power actually possessed by the surface of any known planet. Astronomers designate the albedo of any planet by means of a fraction indicating the ratio of light reflected to the total quantity of light received. Thus the moon's average albedo is 0.13, which means that about one-sixth of the light received by the moon from the sun is again reflected. The albedo of Mercury is 0.14; of Venus, 0.76; of the earth (roughly), 0.20; of Mars, 0.22; of Jupiter, 0.62; of Saturn, 0.72; of Uranus, 0.60; and of Neptune, 0.52.

ALBEMARLE, First Duke of. See Monk or Monck, George.

ALBEMARLE, The. A Confederate ram, which, after doing great damage to the Federal shipping, was blown up and completely destroyed on the night of October 27, 1864, by W. B. Cushing. See Cushing, W. B.

ALBEMARLE, or **ISABELLA, ISLAND.** The largest of the Galapagos Islands (q.v.), lying between lats. 0° 15′ N. and 1° 5′ S., and longs. 90° 50′ W. and 91° 45′ W. It is of volcanic origin and irregular in form, its greatest length about 90 miles and its greatest breadth about 50. The surface, which covers an area of 1650 square miles, is elevated, reaching an altitude of 4700 feet. Albemarle Point is the northernmost extremity of the island.

ALBEMARLE SOUND. An inlet in the coast of North Carolina, 60 miles long and 4 to 15 miles wide, separated from the ocean by an island, and not appreciably affected by the tides (Map: North Carolina, F 1). It receives the Roanoke, Chowan, Perquimaus, Little, and Pasquotauk rivers, and is connected with Currituck and Croatan sounds, the latter of which flows into Pamlico Sound. It is about 12 miles in length, and its greatest depth is 18 feet. It is so shallow in some places that it is of little value for navigation.

ALBER, äl′bĕr, Matthäus (1495-1570). A German theologian, one of the promoters of the Reformation. He was born at Reutlingen, near Stuttgart, was educated at Tübingen, and in 1521 returned to preach in Reutlingen, where he introduced the Reformation. He rejected Latin, and used the native tongue in church services, put out the images, and took a wife. He was summoned before the imperial chambers, and charged with nearly seventy distinct heresies, to all of which, save that of speaking disrespectfully of the mother of Christ, he confessed guilty. He was tried, but set free without punishment. Alber was a friend and ally of Luther. He has been called, indeed, the "Luther of Swabia," because of the great part he played in that country. Some of his sermons, a catechism, and a work on *Providence* have been published. For his life consult J. Hartmann (Tübingen, 1863).

ALBERDINGK THYM, äl′bĕr-dĭnk tĭm′, Josephus Albertus (1820-89). A Dutch author, born at Amsterdam. In 1876 he was appointed professor of æsthetics in the Art Academy at Amsterdam. From 1852 he edited the *Volksalmanak voor Nederlandsche Katholicken,* and from 1855 *De Dietsche Warande,* devoted to the art and literature of the Middle Ages. He published newspaper criticisms, *Drie Gedichten* (1844), *De Klok van Delft* (1846), *Palet en Harp* (1849), *Verspreide Verhalen in Proza* (3 volumes, 1879-83), and other volumes. His prose fiction is considered his best work. Consult the biography by Van der Duys (1889).

ALBERIC I., äl′bĕr-ĭk (died 925). An adventurer, of Lombard extraction, who appeared in Rome in 889. He soon joined his fortunes with those of Berengar (q.v.), became Margrave of Camerino, and later Duke of Spoleto. He married Marozia (q.v.) before 915, and in 916 joined John X. in expelling the Saracens, who had terrorized Italy for more than thirty years. For his services he was probably made "Consul of the Romans." Nothing definite is known of his later years; but he is said to have ruled Rome despotically for a time, to have been driven from the city, to have summoned the Hungarians to his aid, and to have been slain by the Romans about 925.

ALBERIC II. (?-954). The son of Alberic I. and Marozia. In 932 he led the Romans in a successful attempt to achieve their independence, and was elected "prince and senator of all the Romans." Until his death, in 954, he ruled the city absolutely, but wisely and moderately. He was succeeded by his son Octavian, who became Pope, as John XII., in 955.

ALBERONI, äl′bā-rō′nē, Giulio, Cardinal (1664-1752). An Italian prelate, minister of Philip V. of Spain. He was the son of a poor vine-dresser, and was born at Firenzuola, in Parma. From a chorister in a church at Piacenza, he quickly rose, through his abilities, to the dignity of chaplain and favorite of Count Roncovieri, Bishop of San Donino. After some diplomatic service in Italy and a visit to Paris, he was sent by the Duke of Parma as *chargé d'affaires* to Madrid, where he speedily gained the favor of Philip V. He brought about the king's marriage to Elizabeth Farnese, overthrew the powerful Countess Orsini, and rapidly became grandee, cardinal, and prime minister (1717). Into the languid body of moribund Spain he infused new energy, invigorated her government, revived her commerce and her manufactures, reconstructed her army, rebuilt her fleet. But Alberoni was ambitious, and in order to gratify the covetous desires of Elizabeth Farnese, he suddenly invaded Sardinia, in violation of the Peace of Utrecht, cherishing the hope of reëstablishing the monarchy of Charles V. and Philip II., and startling Europe by his insolent audacity. The regent of France broke off his alliance with Spain, and united himself with England and Austria. Alberoni was not dismayed. Even when the Spanish fleet in the Mediterranean was destroyed by an English one, he contemplated an extensive war by land, in which all the European powers were to have been entangled. He patronized the Pretender, to annoy England, and the French Protestants, to annoy France. He sought to unite Peter the Great and Charles XII. with him, to plunge Austria into a war with the Turks, and to stir up an insurrection in Hungary; and, through his influence with one of the parties at the French court, he actually accomplished the arrest of the regent himself (the Duke of Orleans). But so universal became the complaints against Alberoni, that Philip lost courage, and made peace, agreeing to the dismissal of the Cardinal. In 1719 Alberoni received a command to quit Madrid within eight days and the kingdom within three weeks. Exposed to the vengeance of every power whose hatred he had drawn upon himself, he knew no land where he could remain. Not even to Rome could he venture, for Clement XI. was more bitterly inimical to him than was any secular potentate. He wandered about in disguise and under fictitious names. At length he was imprisoned in the Genoese territory, through the solicitation of the Pope and the Spanish monarch; but he speedily recovered his liberty, and two years after the death of Clement, was reinstated by Innocent XIII. in all the rights and dignities of a cardinal. In 1740 he retired to Piacenza, where he died twelve years after, at the age of eighty-eight. He bequeathed his possessions in Lombardy to Philip V., while his cousin and heir, Cesare Alberoni, became possessor of 1,000,000 ducats. Consult: Rousset, *Histoire du Cardinal Alberoni* (The Hague, 1719, English translation, London, 1719); Bersani, *Storia del cardinale Giulio Alberoni* (Piacenza, 1862).

ALBERS, ăl′bẽrs, Johann Friedrich Hermann (1805-67). A German physician, professor of pathology at Bonn. He established there an asylum for the treatment of insanity and nervous diseases, and was director of the pharmacological cabinet. His atlas of pathological anatomy (Bonn, 1832-62, 287 plates) and books on various branches of medical science were regarded as standard works, and are still useful and interesting.

ALBERT, ăl′bẽrt; *Ger. pron.* äl′bĕrt. In Goethe's *Sorrows of Werther* (q.v.), the husband of Lotte, with whom Werther is in love. The character is said to be taken from that of Goethe's friend Kestner.

ALBERT, ăl′bẽrt. A character in Sheridan Knowles's comedy, *The Beggar of Bethnal Green* (q.v); the beggar, who is Lord Wilfrid in disguise.

ALBERT, Ger. **ALBRECHT**, äl′brĕᴋt. The name borne by five archdukes of Austria, of whom two (I. and V.) were also emperors of Germany. Albert I., Archduke of Austria and Emperor of Germany, was the eldest son of Rudolph of Hapsburg, and was born in 1248. Rudolph, before his death, endeavored to have Albert appointed as his successor in the Empire; but the Electors, already aware of the tyranny of Albert, refused to comply. After the old king's death Austria and Styria revolted; but Albert, having vigorously crushed the rebellion, turned his attention toward the Empire. The Archbishop of Mainz, an instrument of the Pope, secured the privilege of appointing the imperial candidate, and named his cousin, Adolphus of Nassau, in 1292. Albert took the oath of allegiance and quietly awaited developments. In 1298, Adolphus, who had disgusted his subjects, was deposed and Albert was elected. He was obliged to fight for the new honor, and met his rival in a battle near Worms, in which Adolphus was defeated and slain. Albert was crowned at Aix-la-Chapelle in August, 1298; but Pope Boniface VIII. declared that he alone was emperor, and denied the right of the princes to elect Albert or to recognize him. Albert, however, made an alliance with Philip the Fair of France, and securing the neutrality of Saxony and Brandenburg, invaded the Electorate of Mainz and forced the Archbishop to make an alliance with him, thus securing a former ally of the Pope. Boniface was alarmed by his success and entered into negotiations with him. As a result, Albert broke his alliance with Philip, recognized the supremacy of the Pope, and promised to defend the rights of the Roman court whenever called upon. Boniface then excommunicated Philip, and offered the throne to Albert in 1303; but Philip soon retaliated by getting the Papacy under the power of the French crown. After this Albert fought unsuccessfully against Holland, Zealand, Friesland, Hungary, Bohemia, and Thuringia. In January, 1308, news arrived of a rebellion among the Swiss in Unterwalden, Schwyz, and Uri, and the Emperor seized this pretext to subjugate the country. An act of injustice, however, occasioned a crime which put an end to his life. His nephew, Duke John, claimed Swabia as his rightful inheritance, but had urged his claims in vain. When Albert was departing for Switzerland, John renewed his demands, but was refused, and so he resolved to be revenged. He conspired against his uncle's life and assassinated him on the road to Rheinfelden, while separated from his followers by the River Reuss. The Emperor expired May 1, 1308, in the arms of a beggar woman. His daughter, Agnes, Queen of Hungary, revenged her father's death. (See John the Parricide.) Albert left six sons and five daughters, the children of his marriage with Elizabeth, daughter of the Count of Tyrol. The story of William Tell is connected with Albert I.

Albert V. (as German king, Albert II.) was born in 1397 and inherited the duchy of Austria while still a child. After receiving what was for the times an excellent education, he assumed direct control of the government in 1411. In 1422 he married the daughter of the Emperor Sigismund, and on the death of the latter, in 1437, succeeded, by election, to the crowns of Hungary and Bohemia. In March, 1438, he was elected King of Germany. Wars with the Turks and disorders in Bohemia and Hungary disturbed his short reign. He died October 27, 1439.

ALBERT (?-1412). Duke of Mecklenburg and King of Sweden, a son of Duke Albert I. of Mecklenburg. Within a year after he was proclaimed King of Sweden (1364) he was compelled to fight against his uncle, Magnus II., whom he defeated and captured at the battle of Enköping. Hakon of Norway, a son of the latter, who had also disputed the right of succession, fled after the battle, but was compelled to sign a treaty of peace in which he renounced all claims to the throne. The victory, however, was bought at the price of great concessions to the Royal Council, and Albert could find no support among the people, who were heavily burdened with taxes. Consequently, an attempt to restore his power failed, and Margaret, widow of King Hakon of Norway, was invited to the throne. Albert was defeated and captured at the battle of Falköping (February 24, 1389), and was not liberated until 1395, when he formally resigned all rights to the crown, and retired to Mecklenburg, which, as Duke Albert II., he ruled until his death. The accession of Margaret to the throne of Sweden led, in 1397, to the formation of the celebrated Union of Kalmar, by which Norway, Sweden, and Denmark were formed into one kingdom.

ALBERT (1490-1568). The last Grand Master of the Teutonic Order and first Duke of Prussia. He was the son of the Margrave Frederic of Ansbach, who wished him to enter the Church. He was educated under the care of Archbishop Hermann, of Cologne, where he became a canon. He did not, however, neglect knightly exercises. He accompanied the Emperor Maximilian I. in his expedition against Venice, and was present at the siege of Pavia. In 1511, when scarcely twenty-one years old, he was chosen Grand Master of the Teutonic Order, the knights expecting their feudal allegiance to Poland to be abolished, on account of his near relationship to Sigismund, the monarch of that country, while they also hoped for protection against the Poles from his friends in Germany. He was consecrated at Mergentheim with his father's consent. In 1512 he removed to Königsberg, having been acknowledged by Poland likewise; but refusing to take the oath of allegiance, he was plunged into a war with Sigismund in 1520. The year after, a four years' truce was agreed to at Thorn. Albert next made his appearance at the Imperial Diet at Nuremberg as a German prince of the Empire, to induce the other princes to assist him against the Poles. But Germany could at that time grant no assistance to any one. Disappointed in his hopes, Albert threw himself into the cause of the Reformation, which had rapidly spread into Prussia and broken the last strength of the declining order, whose possessions now appeared a certain prey to Poland. He still hoped to preserve these by acting upon Luther's advice to declare himself secular Duke of Prussia and place his land under the sovereignty of Sigismund. This was done with great pomp at Cracow in April, 1525, the duchy being secured to him and his descendants. During the remainder of his life Albert zealously sought to further the welfare of his duchy. He regulated the administration of all affairs, both secular and ecclesiastical, established the ducal library, founded in 1544 the University of Königsberg, gathered many literary men around him, and caused their works to be printed. In 1527 he married Dorothea, daughter of Frederick, King of Denmark. Albert earnestly desired peace, but found himself entangled in conflicts with the nobles and in theological disputes, which, along with other troubles of a more personal character, saddened the close of his life. Consult: Lohmeyer, *Herzog Albrecht von Preussen* (Dantzic, 1890); and for the part played by Albert in the Reformation, Tschakert, *Herzog Albrecht von Preussen* (Halle, 1894).

ALBERT (1559-1621). Archduke of Austria. He was the sixth son of the Emperor Maximilian II. He was brought up at the Spanish court, and dedicated himself to the Church. In 1577 he was made cardinal, in 1584 Archbishop of Toledo, and during the years 1594-96 held the office of Viceroy of Portugal. He was next appointed Stadtholder of the Netherlands. In 1598 he resigned his ecclesiastical offices and left the Church, and married the Infanta Isabella, receiving with her the Netherlands and Franche Comté. Had it been possible to regain by any means Spain's rebellious provinces, Albert's mild character and conciliatory policy might have done so. As it was, he became engaged in constant warfare prosecuted with little success and marked by bitter feeling on both sides. Later in life he became fanatic, priest-ridden, and in a measure incapable of efficient rule. Consult: Dubois, *Histoire d'Albert et d'Isabelle* (Brussels, 1847); Schmolke, *Albert und Isabella* (Berlin, 1878).

ALBERT (1490-1545). Archbishop of Magdeburg and Elector of Mainz, generally called Albert of Brandenburg. He was the younger son of the Elector John Cicero of Brandenburg, and was born in Brandenburg, June 20, 1490. In 1513 he became Archbishop of Magdeburg, and also administrator of the bishopric of Halberstadt, and in the next year Archbishop and Elector of Mainz. He was put in charge of the preaching, within a certain district, of the jubilee indulgence granted by Leo X., on the condition that one-half the proceeds was to be sent to Rome. He appointed the Dominican Tetzel sub-commissioner in the work, whose preaching gave occasion to Luther to post up his well-known ninety-five theses. He was made a cardinal in 1518. Even in the Archbishop's own diocese the reformer's doctrines found not a few adherents, so that Albert was compelled at the Imperial Diet at Augsburg (1530) to act the part of peacemaker. When he joined the holy alliance against the League of Schmalkalden, Luther made a fierce attack on him in writing. He was the first of all the German princes who received the Jesuits into his dominions. In 1541 he granted religious liberty to his subjects, under the condition that they should pay his debts, amounting to 500,000 florins. He died at Mainz, September 24, 1545. For his life consult: J. May (Munich, 1865-75); Redlich, *Albert und das Neue Stift zu Halle* (Mainz, 1900).

ALBERT, called ACHILLES (1414-86). Elector of Brandenburg, third son of Friedrich I. and Elizabeth of Bavaria. He was born at Tangermünde, and after the death of his father, in 1440, succeeded to the margraviate of Ansbach, where, together with several other feudal lords, he soon came into conflict with the inhabitants of the cities of South Germany, which were united against him. In 1449 he attacked Nuremberg, but was defeated at Pillenreut and compelled to effect a permanent compromise (1453). By the death of his brother John he succeeded to the margraviate of Bayreuth, and in 1470 his brother Friedrich II. transferred to him the margraviate of Brandenburg and the electoral dignity. He was fond of display and amusements, and was distinguished by an enlightenment far in advance of his age.

ALBERT, called ALCIBIADES (1522-57). A margrave of Brandenburg, who was born at Ansbach. Although reared in the Protestant faith, his military enthusiasm and love of power induced him to serve in the army of Charles V., and he fought in the campaign against France in 1543. Afterward he conspired against the Emperor with Maurice of Saxony and several other princes, and was personally instrumental in arranging the Treaty of Chambord with Henry II. of France (January 15, 1552). In consequence of differences with his confederates, he subsequently again embraced the cause of Charles, who ratified his territorial claims. In an endeavor to carry these into effect, however, Albert was twice defeated (July 9 and September 12, 1553). He was soon afterward outlawed by the Emperor, and fled to France (1554). He died in 1557, shortly after his return to Germany.

ALBERT, called THE BOLD (1443-1500).

Duke of Saxony, founder of the Albertine line. He was a younger son of the Elector Frederick, called "the Gentle." From 1464 he reigned conjointly with his brother Ernest, who had been invested with the electoral dignity, and gradually obtained such valuable accessions of territory in Thuringia and elsewhere that a separation into the Ernestine and Albertine branches became necessary. At the Reichstag held at Freiburg, in 1498, he was appointed "hereditary governor and potentate" of Friesland. A magnificent bronze monument was dedicated to him at Meissen in 1876.

ALBERT, ȧl′bär′, Alexandre Martin (1815-95). One of the leading members of the provisional government of France after the revolution of February, 1848. Though a poor mechanic, he took great interest in the political questions of his time, and participated in the revolutions of 1830 and 1848. While keeping at his trade, he edited a workingman's paper, started in 1840, called *L'Atelier*. He was summoned by Louis Blanc from his shop, where he was making buttons, to the presidency of the committees on the national workshops and national rewards, but presently resigned and entered the assembly. For his participation in the attempt of May 15, 1848, to overthrow the government, he was condemned to imprisonment for life, but was pardoned in 1859 by Louis Napoleon. He appeared for a moment during the Commune of 1871, but sank back into obscurity. He was known in French politics as *L'ouvrier Albert*.

ALBERT, ăl′bẽrt, Aristides Elphonso Peter (1853 —). A bishop of the Methodist Episcopal Church, South, and also a practicing physician and surgeon. His father was a Frenchman, his mother a slave, and he was born in St. Charles Parish, Louisiana. Freed by the war, he removed with his mother to New Orleans. He graduated in arts and theology at Straight University, New Orleans, and in medicine at New Orleans University (1892). After holding various appointments in the Methodist Episcopal Church, South, including that of editor-in-chief of the *Southwestern Christian Advocate* (five years) and the presidency of Gilbert College, Baldwin, La. (1896-1900), he became pastor of Wesley Chapel, New Orleans (1900-2). He represented his conference in the Ecumenical Conference in London in 1901.

ALBERT, Count of Bollstädt (c. 1193-1280). A German philosopher, usually called Albertus Magnus, and styled *Doctor Universalis*, who was distinguished for the extent of his acquirements and for his efforts to spread knowledge, especially of the works and doctrines of Aristotle. He was born at Lauingen, in Swabia, probably in 1193, but the date is disputed. After studying principally at Padua, he entered the order of the Dominican friars in 1221 and taught at Bologna, Strassburg, Freiburg, and Cologne, where Thomas Aquinas became his pupil. He afterward repaired to Paris, where he expounded the doctrines of Aristotle. In 1259 he received from Pope Alexander IV. the bishopric of Ratisbon. But in 1262 he retired to a convent at Cologne to devote himself to literary pursuits. Here he composed a great number of works, especially commentaries on Aristotle. In 1270 he preached a crusade. He died November 25, 1280. The fullest edition of his works was prepared by Jammy (21 volumes, Lyons, 1651), but it is uncritical and far from complete. Many of the writings attributed to him seem to be spurious, among others, that entitled *De Secretis Mulierum*, which was widely circulated during the Middle Ages. The extensive chemical and mechanical knowledge which Albert possessed, considering the age in which he lived, brought upon him the imputation of sorcery, and in German tradition he has a very ambiguous reputation. It is related, for instance, that in the winter of 1240 he gave a banquet at Cologne to William of Holland, King of the Romans, and that during the entertainment the wintry scene was suddenly transformed into one of summer bloom and beauty. This myth may rest on the fact that Albert had a greenhouse. The scholastics who followed Albert's opinions took the name of Albertists. His best-known works are *Summa Theologiæ* and *Summa de Creaturis*.

ALBERT, Count of Geierstein, gī′ẽr-stīn. In Scott's novel, *Anne of Geierstein* (q.v.), the head of the "Secret Tribunal." At various times he appears in monkish disguise; later he slays Charles of Burgundy in battle.

ALBERT, ăl′bẽrt; *Ger. pron.* äl′bĕrt, Eduard (1841-1900). An Austrian surgeon. He was born at Senftenberg, in Bohemia, and studied medicine at Vienna. In 1873 he was made professor of surgery at Innsbruck. From 1881 until his death he was clinical professor of surgery at Vienna. His published works include: *Beiträge zur Operativen Chirurgie* (Vienna, 1878-80); *Diagnostik der Chirurgischen Krankheiten* (seventh edition, Vienna, 1896); and a text-book of surgery in four volumes, which has passed through several editions. Albert's original researches resulted in valuable contributions to surgical diagnosis, to operative surgery, and to other branches of his profession.

AL′BERT, *Fr. pron.* ȧl′bär′, Eugen Francis Charles d' (1864—). A pianist and composer; born at Glasgow, April 10, 1864; the son of Charles d'Albert, a French musician and dancing-master, who was his first teacher. He studied in the National Training School, London, under Sir Arthur Sullivan, Prout, and Pauer, and in 1881 gained the Mendelssohn scholarship; under Hans Richter in Vienna and under Liszt in Weimar. In the same year he made his first appearance at a philharmonic concert in Vienna with brilliant success. He was soon made court pianist in Weimar, traveled in Europe, and came to America in 1889-90 and 1904-5. His interpretations of Bach and Beethoven have been generally deemed the most forceful heard in recent years. His mastery of technique, intellectual grasp, force, and fire place him among the most eminent pianists of the world. His compositions include pianoforte music, a suite, symphony, two quartets for strings, several songs, and the operas *Der Rubin* (1893); *Ghismonda* (1895); *Gernot* (1897); *Die Abreise* (1898); *Kain* (1900); *Der Improvisator* (1900); *Im Tiefland* (1903). His later compositions show distinct individuality. He has also made excellent transcriptions for piano of some of Bach's organ works.

ALBERT, ăl′bẽrt; *Ger. pron.* äl′bĕrt, Francis Charles Augustus Emanuel (1819-61). Prince of Saxe-Coburg-Gotha, and the husband of Queen Victoria of Great Britain. He is popularly known as Prince Albert and the Prince Consort. He was born at Rosenau Castle, near Coburg, August 26, 1819, the second son of Ernest, Duke of Saxe-Coburg-Gotha, and his wife Louise, daughter of Augustus, Duke of Saxe-Gotha-Altenburg. In the Prince's sixth year his parents separated, and he never afterward saw his mother, who died in 1831. The Prince and his elder brother, under a private tutor, received a careful education, and after a year of study at Brussels he attended the University of Bonn, where, in addition to the sciences connected with statecraft, he devoted himself with ardor to the study of natural history and chemistry, and displayed great taste for the fine arts, especially painting and music. Several compositions of his obtained publicity, and an opera, afterward performed in London, is said to have been composed by him. He was gifted with a handsome figure, and obtained expertness in all manly exercises. He married the young Queen of Great Britain on February 10, 1840. On his marriage Prince Albert received the title of Royal Highness, was naturalized as a subject of Great Britain, and obtained the rank of field-marshal, the knighthood of the Order of the Bath, and the command of a regiment of hussars. As the union proved in the highest degree a happy one, the Prince was loaded with honors and distinctions both by the Queen and the nation. The title of Consort of Her Most Gracious Majesty was formally conferred in 1842, and that of Prince Consort, in 1857, made him a prince of the United Kingdom. He was also made a member of the Privy Council, governor and constable of Windsor Castle, colonel of the Grenadier Guards, acting Grand Master of the Order of the Bath, chancellor of the University of Cambridge, the standard of which he succeeded in raising considerably, and Master of the Trinity House. Notwithstanding his high and favored position as the Queen's trusted counselor, the Prince, with rare prudence and tact, abstained from meddling with State affairs, and thus escaped the jealousy and detraction of parties, gradually attaining, indeed, the widest popularity. When the Whig ministry in 1840 proposed to him the income of £50,000, as consort of Queen Victoria, the Tories, in conjunction with the Radicals, succeeded in limiting the sum to £30,000. This incident, which occurred before the marriage, appears to have been the only instance of any manifestation of party feeling with reference to the Prince. On the other hand, he opened for himself an influential sphere of action, in the encouragement and promotion of science and art, appearing as the patron of many useful associations and public undertakings. The Exhibition of 1851 owed its origin and the greater part of its success to the Prince. An incessant worker in the interests of his adopted country, his toil undermined his constitution, and he succumbed to an attack of typhoid fever, December 14, 1861. His memory is perpetuated under the surname "Albert the Good." The last of his political acts, one of particular interest to the United States, was instrumental in preventing a war which threatened to arise out of the seizure of the Confederate envoys on the English steamer *Trent*. The draft of the ministerial ultimatum submitted to the Queen seemed to the Prince fraught with perilous irritation. Weak then from the beginning of his last illness, he arose at seven the next morning (December 1, 1861), and wrote and presented a memorandum of his objections to the Queen. His suggestions, adopted by Lord Russell, proved acceptable to President Lincoln. Consult: Martin, *Life* (London, 1875-80); Vitzthum, *Reminiscenses* (English translation, 1887); Grey, *The Early Years of His Royal Highness the Prince Consort* (New York, 1867); Dunchley, *The Crown and the Cabinet: Five Letters on the Biography of the Prince Consort* (Manchester, 1878); Kenyon, *Albert the Good* (London, 1890); Wintle, *The Story of Albert the Good* (London, 1897); Stockmar, *Denkwürdigkeiten aus den Papieren des Freiherrn Christian Friedrich von Stockmar* (Brunswick, 1872), translated by G. A. M. under the title *Memoirs of Baron Stockmar* (London, 1873).

ALBERT, FREDERICK AUGUSTUS (1828-1902). King of Saxony, 1873-1902. He served in the first Schleswig-Holstein War, and after his father's accession in 1854, presided over the Council of State. In 1866 he commanded the Saxon army, coöperating with Austria against Prussia. On the entrance of Saxony into the North German Confederation, this force became the twelfth corps of the North German army, and with them the Prince won high honors at Gravelotte and Sedan, receiving the Prussian Iron Cross and the command of the newly formed fourth army, at the head of which he entered Paris with the Emperor and the German princes. He succeeded his father in the throne in 1873. He died June 19, 1902, and was succeeded by his brother Georg. Consult Dittrich, *König Albert und Prinz Georg von Sachsen* (Minden, 1896).

ALBERT, FREDERICK RUDOLPH (1817-95), generally spoken of by English writers as the Archduke ALBERT. Archduke of Austria, son of Archduke Charles, grandson of Leopold II., and first cousin of the father of the reigning emperor. He was distinguished in youth as a cavalry commander, doing good service in the battle of Novara in 1849. He was governor of Hungary, 1851-60; in 1866 he commanded the Austrians in Venetia, and won the victory of Custozza, June 24; but Benedek's defeat at Sadowa, July 3, made his success nugatory. He became Field-Marshal in 1863 and Inspector-General of the Austrian Army in 1866. Albert married, May 1, 1844, Archduchess Hildegarde, daughter of Ludwig I. of Bavaria. She died April 2, 1864.

ALBERT, HEINRICH (1604-51). A celebrated German composer, sometimes erroneously called Alberti, who was instrumental in developing the present form of the German *Lied*. He was born at Lobenstein, Saxony, and in 1622 went to Dresden to study music under his uncle, the Kapellmeister Heinrich Schütz. In conformity with the wishes of his parents, however, he discontinued his musical studies and entered the University of Leipzig to study law. He resumed the study of music at Königsberg in 1626, under Stobäus, and three years later became organist at the cathedral in that city. Albert was not only a fine musician, but a poet of distinction as well, and the verses which he set to music were usually of his own composition. Several of these, however, were written by the poet Simon Dach, an intimate friend of Albert, and one whose influence is still evident in the well-defined poetic rhythm of the song-forms created by the latter. Albert published eight books of arias (1638-50) and the *Kürbishütte* (1645), a collection of chorals, arias, and *Lieder* for one or several voices. Many of his hymn-tunes, such as the well-known *Gott des Himmels und der*

Erden, Ich bin ja, Herr, in Deiner Macht and *Unser Heil is Kommen*, are still extensively used in the Protestant service. A selection of his songs, with the music, has been published in the work entitled *Neudrucke Deutscher Litteraturwerke* (Halle, 1883).

ALBERT, Joseph (1825-86). A German photographer, who was born and died at Munich. He established a photographer's studio at Augsburg in 1840, and removed to Munich in 1858. About 1867 he introduced an improvement of the greatest importance in photo-mechanical printing (*Lichtdruck*). It had been known since about 1854 that a film of gelatine containing potassium-bichromate does not receive greasy inks unless it has been previously subjected to the action of light and damping. This fact had been utilized for printing purposes by coating a metal plate with gelatine containing some bichromate of potash and chloride of mercury, treating with silver oleate, and exposing to the action of light through a negative. On washing and inking with a lithographic roller, the plate could be used for printing. The soft gelatine coating, however, was extremely perishable, and therefore the process was capable of only limited application, until Albert introduced his improvement. Albert found that the gelatine could be sufficiently hardened and rendered durable simply by the action of light. In place of the old metallic plates, he therefore substituted transparent plates, the uncoated side of which he exposed to the action of light. In this manner it became possible to obtain more than a thousand "Albertype" copies from one plate, and the process was adopted in general use. See Gelatin Process.

ALBERT I., called The Bear (1106-70). Margrave of Brandenburg. He was the son and successor of Otto the Rich, Count of Ballenstädt, and of Eilika, daughter of Magnus, Duke of Saxony. Having aided the Duke of Saxony, who became the Emperor Lothair, he received from the latter Lusatia, to be held as a fief of the Empire, and later the northern "mark." In the year 1138, Henry, Duke of Saxony, having been put under the imperial ban, the duchy was given to Albert, when he took the title of Duke of Saxony. Henry, however, was victorious in the contest which followed, and Albert was compelled to flee, and retained only the margraviate of Northern Saxony. Afterward Swabia was given to him as an indemnity. Returning to his own country, he had himself invested with the lands which he had conquered from the Wends, as a hereditary fief of the Empire, and thus became the founder and first margrave of the new State of Brandenburg. Consult Heinemann, *Albrecht der Bär* (Darmstadt, 1864).

ALBERT I. (1317-79). Duke of Mecklenburg, founder of the present reigning dynasty. He was a son of Prince Henry II., the Lion, and reigned as prince from 1329 until 1348, when he was appointed duke by the Emperor Charles IV. Relying upon the cities of his realm, he sought to suppress the frequent feuds of the nobles, and to find advantages by active participation in the affairs of the Empire. Upon the extinction of the dynasty of Schwerin, he united the domains of that principality with his own (1358). He was also instrumental in securing the crown of Sweden for his son, afterward known as Albert II. See Albert Duke of Mecklenburg, and King of Sweden.

ALBERT II., Duke of Mecklenburg. See Albert, King of Sweden.

ALBERT IV., called The Wise (1447-1508). Duke of Bavaria, third son of Albert III., surnamed "the Pious." After the death of his father in 1460 he was placed under the guardianship of his elder brothers, John III. and Sigismund, who had conjointly succeeded to the regency; and upon the death of John (1463), he became co-regent with Sigismund. The acquisition of the territories of the house of Bavaria-Landshut greatly increased the extent of his possessions. In consequence of this increase of power, however, he became involved in a feud with several members of the nobility, and his interference in the affairs of Regensburg (Ratisbon) finally aroused the displeasure of the Emperor and he was placed under the ban. His principal achievement was the establishment of the law of succession in the dukedom of Bavaria (July 8, 1506).

ALBERT V. (1528-79). Duke of Bavaria, a son of Duke William IV. and Maria Jakobäa of Baden. He succeeded to power in 1550, and soon became involved in religious and other disputes, in consequence of which the power of the feudal barons in his dominions was completely broken. He banished the Protestants from his dominions and prohibited the publication of books favorable to them. It was due to his initiative that Munich afterward became a great centre of art. He greatly encouraged engraving, painting, brass-founding, and the industrial arts, and laid the foundation of a museum of art as well as of a museum of antiquities, a gallery of paintings, and a royal library. Upon his death he left debts to the amount of two and a half million florins.

ALBERTA, a province of Canada established on September 1, 1905, with Saskatchewan (q.v.), by the Dominion Parliament. It was formed out of the former district of Alberta, and parts of the former districts of Athabasca, Saskatchewan, and Assiniboia, and its boundaries are described as the line of the sixtieth degree of north latitude on the north, British Columbia on the west, the international boundary line on the south, and the fourth meridian in the Dominion system of land surveys on the east. The area is given officially as 253,540 square miles, of which 41,000 square miles are declared to be suitable for the cultivation of grain, 41,000 square miles in need of irrigation, 113,559 square miles suitable for grazing purposes, and about 20,000 square miles under water. The population in 1901 was officially given as 72,841; but immigration since that year has increased so rapidly that an estimate of 170,000 population in 1906 is conservative. The northern half of the province, and the eastern part of the southern half are, generally speaking, level; but the western part below latitude 56° N., and the southwestern, as it nears the foothills of the Rocky Mountains, become broken and hilly. Most of the eastern half and part of the western are prairie land. Central Alberta is well timbered and well watered. The western part of Lake Athabasca is within the limits of the province, and there are numerous smaller lakes. The river systems are of great importance in determining the fertility of the soil by the intersecting valleys which they create. The Athabasca and Peace rivers, joined by numerous tributaries, flow northerly and northeasterly respectively into Lake Athabasca, and thence into the Mackenzie River system and the Arctic Ocean; the Saskatchewan, north and south branches, and tributaries traverse the western part of the province and join the system that drains into Hudson's Bay; in southern Alberta some of the tributaries of the Missouri River take their rise and thence drain into the Mississippi and the Gulf of Mexico.

The soil of Alberta is exceptionally rich in the great central region, consisting chiefly of from one to three feet of black vegetable mould, with but small mixture of sand and gravel. The eastern part, except in the south, is not so fertile; and in the south the comparative lack of moisture is being supplied by irrigation. This portion, which was formerly given up to ranching, has recently been devoted in many places to mixed farming, and promises a considerable increase in that respect. Irrigation works receive government supervision and aid, and have also been undertaken by many farmers on their own lands, and by corporations, including the railway companies. In 1906 one of the latter was engaged in an irrigation scheme which embraced 3 000,000 acres between Bow and Red Deer rivers. The climate of the province is healthful and invigorating, extremes of heat and cold being mitigated by the dryness of the air. The Chinook winds that blow from the west across the Rocky Mountains melt the snow, so that cattle and horses can live in the open air throughout the winter. The average annual temperature at Edmonton is about the same as that of Saint Paul, Minnesota. The mean temperature for July in Winnipeg is 66°. The possibilities in cereal crop raising in Alberta have during 1900-5 received wide attention. Wheat, oats, and barley are most successfully cultivated, especially in Central Alberta. Wheat often produces 40, barley 60, and oats 70 to 85 bushels per acre, the latter sometimes producing 100 weighed bushels per acre. Winter wheat, of which there were 65,000 acres under crop in 1905, was expected, according to actual threshing returns, to average nearly 30 bushels per acre, and in 1903 there was of this variety an average of 23.86 bushels per acre. Root crops are also successful, and in southern Alberta the sugar beet, which is of exceptional quality, promises large proportions to this industry. Apples are grown; so is tobacco in certain parts, and among the native small fruits are raspberries, strawberries, gooseberries, cranberries, cherries, and black currants. In the lakes fish are plentiful, and an abundance of small game, such as mallard, teal, wild goose, partridge, and prairie chicken, is found. Twelve government creameries and a large number of others attest the growth of dairying, and the industry is organized with special reference to cold storage and rapid shipment.

The mineral deposits of Alberta are especially rich. There are large areas underlaid with bituminous coal, semi-bituminous, and lignite. There is an extensive and valuable anthracite deposit in the neighborhood of Banff, on the Canadian Pacific Railway. Gold has been found in the vicinity of Edmonton, and along the banks of the Athabasca, Saskatchewan, Pembina, Macleod and other rivers. Galena, with a large percentage of silver, has also been found.

The railway development of the province since 1900 has been remarkable. In addition to the main line of the Canadian Pacific, which was completed to Vancouver in 1885, there are various branch lines of that railway, one of which stretches north from Calgary to Edmonton, and another south from Calgary to Macleod. The Canada Northern, already partly built; the National Transcontinental or Grand Trunk Pacific, partly owned and constructed by the Federal government, and partly by the railway company; a new line to be built rapidly by James J. Hill; the projected Trans-Canada Railway, to have a more northerly route—all these transcontinental lines, with numerous branches, promise every facility to industry and commerce. The chief towns are Calgary, Edmonton, and Strathcona, with populations in 1906 of 15,000, 8500 and 3500 respectively; but there are many other towns of importance that are growing very rapidly. There are still millions of acres of free lands. In 1905 the immigration into Manitoba, Saskatchewan, and Alberta amounted to 146,266, of which the last-named province received about one third. Of these immigrants 65,359 were British, 43,652 from the United States, and 37,255 from Continental Europe.

The government of Alberta is organized on the same principle as other provinces of the Dominion. The capital is Edmonton. The province is represented in the Dominion Senate by 4 members, a number which may be increased to 6 after the next decennial census. To the House of Commons it sends five representatives until the next quinquennial census, when its ratio of representation is to be the same as that established for the rest of the Dominion. The legislative power is vested in an assembly of 25 members with the lieutenant-governor, who is aided in the performance of his executive duties by an appointive council. The following grants are made by the Dominion government towards the provincial treasury: for the support of the government and legislature, $50,000; an allowance of 80 cents per head on an estimated population of 250,000 and up to 800,000, yielding at present $200,000; compensation for the share of the public debt falling on the province which has no debt of its own, 5 per cent. on the sum of $8,107,500 or $405,375; compensation for the retention by the Dominion government of public lands within the province, 1 per cent. on an estimated valuation of $37,500,000 until the population shall exceed 400,000, 1½ per cent. until a population of 800,000 is reached, 2 per cent. when 1,200,000 has been reached, and 3 per cent. thereafter; for the construction of the necessary public buildings one-fourth of 1 per cent. on the valuation of the public lands is granted for a period of five years. The lands granted to railways within Alberta aggregate 13,151,264 acres, and an equal area, approximately, is distributed in the form of Indian reservations, parks, school lands, and the possessions of the Hudson's Bay Company. A clause in the organizing Act guarantees to the minority, in the matter of education, the rights and privileges conceded by chapters 29 and 30 of the North West Ordinance of 1901. These include the power to establish schools for the minority, of which the most distinctive feature is the right to provide for a half-hour of religious instruction at the close of each school day. For the controversy over the educational clause in Parliament, one of the most earnestly debated questions of the day, see Canada. The formal inauguration of provincial government took place at Edmonton on September 1, in the presence of Earl Grey, the governor-general of Canada, and Sir Wilfred Laurier, the Dominion premier. George Hedley Vicars Bulyea was installed as first-lieutenant governor, and A. C. Rutherford, a leading Liberal politician, was entrusted with the task of organizing the first government of the new province. Legislative elections took place on November 9, and resulted in the election of twenty-three out of twenty-five members to support the new Administration. The first Legislature assembled at Edmonton early in 1906.

AL'BERT CHAP'EL. A memorial chapel in Windsor Castle. See Windsor Castle.

ALBERT ED'WARD. See Edward VII.

ALBERT ED'WARD NYAN'ZA, called by the natives Muta-Nzige. A lake in central Africa, a little south of the equator, on the boundary line between the Congo Free State and the British protectorate of Uganda (Map: Africa, G 5). It is situated at an altitude of more than 3100 feet, and is one of the sources of the Nile. It is about 50 miles long, and is connected by the Semliki River (about 130 miles) with the Albert Nyanza on the north. The lake was discovered in 1876 by Stanley, who regarded it as the southern part of Albert Nyanza. On his subsequent visit, 1889, he explored it thoroughly, and named it in honor of the then Prince of Wales, now King Edward VII. For geological features, see Albert Nyanza; Great Rift Valley.

ALBERT EMBANK'MENT. The name given to a part of the Thames Embankment (q.v.), London.

ALBERT HALL, The Royal. A large amphitheatre in Kensington, London, built in 1867-71 for concerts and other great assemblies. In shape the building is oval, 270 by 240 feet in dimensions; it seats 8000 people. Its style is Italian Renaissance, the material being brick and the chief external ornament a frieze in terra cotta, representing the different races of men. Its organ, which has nearly 9000 pipes, is famous as one of the largest in the world.

ALBERTI, âl-bĕr'tê, Domenico (1707-40). An Italian composer. He was born in Venice, and died in Formio. A style of broken chord bass-accompaniment, which he developed, still is called "Alberti" or "Albertinian" bass.

ALBERTI, Leone Battista degli (1404-72). An Italian architect and writer, born in Venice, of the noble Florentine family of the Alberti, recalled from exile in 1428. He was the leader in the second phase of early Italian Renaissance architecture, both by the works he executed and by his theoretical writings and teachings. He lived principally in Rome, was secretary to six popes, and was for a time charged with the projects for rebuilding St. Peter's and the Vatican. The purity of his classic taste is shown in the façade of the church of St. Francis at Rimini, reproduced from the arch of Augustus at Rimini. His intended use here of the dome, his barrel vaults at St. Andrea in Mantua, show how in construction he also returned to the forms of ancient Roman architecture. He had a number of pupils and associates, who carried out his plans: Matteo dei Pasti, at Rimini; Fancelli, at Mantua; Bertini in the façade of St. Maria Novella at Florence (where he so successfully copied the mediæval style of incrusted marbles); and Rossellino in the famous Rucellai Palace (1446-51) at Florence, which combined the older rustic with the smooth pilastered style. His book *De Re Ædificatoria* (1485) was the first great work on architecture of the Renaissance, and had been preceded by a manual on the five orders, as well as by other manuals on statuary and painting. He prepared the way for Bramante.

ALBERTIS, Luigi Maria d' (1841-1901). An Italian traveler, born at Voltri. He attended the College of Savona, and served in the army of Garibaldi in 1860. From 1871 to 1878 he made a careful exploration and study of the Island of New Guinea. The results of this expedition he published in his *Esplorazione della Nuova Guinea* (1880; English translation, 1880).

ALBERTINELLI, âl-bĕr'tê-nĕl'lê, Mariotto (1474-1515). An Italian painter, born in Florence, the friend and most efficient colleague of Fra Bartolommeo (q.v.), who was his fellow-pupil under Cosimo Roselli. It is difficult to separate the works of the two; together they produced an "Assumption" (Berlin) and a "Last Judgment" (Santa Maria Novella, Florence). Albertinelli's own principal works are a splendid "Visitation" (Uffizi), a "Holy Family" (Pitti), and an "Annunciation" (Academy, Florence).

AL'BERTITE. A form of asphaltic coal obtained at Hillsborough, Albert Co., New Brunswick, Canada, where it occurred in a fissure vein in rocks of the Upper Devonian age. It is a soft, jet black mineral that has been derived from petroleum by oxidization of the oily contents, and it was at one time highly prized as a gas-enricher. See Asphaltic Coal.

AL'BERT LEA. A city and county seat of Freeborn Co., Minn., 95 miles (direct) south of Minneapolis, on the Chicago, Milwaukee and St. Paul, the Minneapolis and St. Louis, the Chicago, Rock Island and Pacific, and other railroads (Map: Minnesota, E 7). The city has a fine location between two lakes, in a region popular as a place of resort; it is the seat of Albert Lea College for women (Presbyterian), opened in 1885, and contains a public library and a handsome court house. It is the market for the agricultural and dairy products (chiefly butter) of the surrounding region, and has grain elevators, a large flouring mill, foundries and machine shops, brick and tile works, corset factories, a metal refrigerator factory, etc. There are some fifty artesian wells of chalybeate waters. Pop., 1890, 3305; 1900, 4500; 1905, 5657.

ALBERT MED'AL. A decoration instituted in England (1866)—in memory of Prince Consort Albert, whose name it bears—to reward heroic acts in saving life at sea. In 1877 it was extended to acts of gallantry in preventing loss of life in perils on land. There are two classes, the first of gold and the second of bronze, with the words "For Gallantry in Saving Life at Sea" or "on Land," as the case may be. See Medal.

ALBERT NYAN'ZA, called by the natives Mwutan-Nzige. A large lake of British East Africa, one of the reservoirs of the Nile, situated in a deep rock-basin, 80 miles northwest of the Victoria Nyanza (Map: Africa, H 4). This lake is the northernmost of a series of five that occupy the lower basins of a great rift valley, that extends for 1000 miles in a general southerly direction to near the mouth of the Zambezi River. Tanganyika and Nyassa occupy other portions of the same rift valley. The Albert Nyanza is of an oblong shape, and is 100 miles long from northeast to southwest, and 25 miles broad, having an area of about 2000 square miles. It is intersected by lat. 2° N. and long. 31° E. The Nile issues from the northern end of the Albert Nyanza, where the outlet of the Victoria Nyanza, the Victoria Nile, discharges into the lake. At its south end the lake receives the Semliki, the outlet of the Albert Edward Nyanza. On the east it is fringed by precipitous cliffs, having a mean altitude of 1500 feet, with isolated peaks rising from 5000 to 10,000 feet. The surface of the lake is about 2100 feet above the sea; its water is fresh and sweet, and of great depth toward the centre. The northern and western shores of the lake are bordered by a massive range of hills, called the Blue Mountains, which have an elevation of about 7000 feet. The existence of this vast lake first became known to Europeans through Speke and Grant, who, in 1862, heard of it under the name of the Luta-Nzige. It was described by the natives as only a narrow reservoir forming a shallow back-water of the Nile. When Speke and Grant, after the discovery of the Victoria Nyanza, were, in 1863, descending the Nile on their return to Europe, they met, at Gondokoro, Sir Samuel White Baker (q.v.), who was ascending the river. After a toilsome march and many adventures, his party came, early in 1864, in sight of the lake, which Baker named in honor of Prince Albert, who was but recently dead. The extent and general outlines of the lake were not accurately determined until 1876, when it was circumnavigated by Signor Romolo Gessi, an Italian explorer attached to General Gordon's Egyptian expedition. A year later, in 1877, Colonel Mason, an American officer in the service of the Egyptian government, made a more careful survey of the lake, fully confirming Gessi's report. See GREAT RIFT VALLEY.

ALBER'TUS MAG'NUS. See ALBERT, COUNT OF BOLLSTÄDT.

ALBI, àl'bē, or **ALBY.** The capital of the department of Tarn in France, built on a height overlooking the river Tarn, which is crossed by a beautiful stone bridge (Map: France, J 8). Albi suffered greatly during the religious wars which devastated the land in the time of the Albigenses, who took their name from this town. The chief buildings are the cathedral, built of brick in a unique style, and, inside, decorated on wall and ceiling with frescoes executed by the first Italian painters of the day. The south portal is a remarkable example of decorated Gothic. It is dedicated to St. Cecilia, and adorned with an exquisite recumbent statue of the martyr in marble. The town maintains a library of over 30,000 volumes (including many incunabula) and a museum. There are large brickyards at Albi, and it has a considerable trade in corn, wine, fruit, etc., and linen, cotton, woolen, and leather manufactures. Pop., 1896, 14,983 ; in 1901, 18,262.

AL'BIA. A city and county seat of Monroe Co., Ia., 67 miles southeast of Des Moines, on the Chicago, Burlington and Quincy, the Iowa Central, the Wabash, and other railroads (Map: Iowa, E 3). With its excellent transportation facilities, the city controls a large trade in coal, which is extensively mined in the county, and in agricultural products, live stock, and grain. Pop., 1890, 2359; 1900, 2889; 1905, 3957.

AL'BIGEN'SES. A name applied to the heretical Cathari in the south of France, about the beginning of the thirteenth century. The name arose from the circumstance that the district of Albigeois, about Albi, in Languedoc, was the first point in southern France where the Cathari appeared. The so-called Albigensian Crusade was undertaken by Pope Innocent III. in 1209. The immediate occasion of it was the murder of the papal legate and inquisitor, Pierre de Castelnau, who had been commissioned to extirpate heresy in the dominions of Count Raymond VI. of Toulouse; but its real purpose was to deprive the Count of his lands, as he had become an object of dislike from his toleration of the heretics. It was in vain that he had submitted to the most humiliating penance and flagellation from the hands of the legate Milo, and had solicited Papal absolution by great sacrifices. The legates Arnold, Abbot of Citeaux, and Milo, who directed the expedition, took by storm Béziers, the capital of Raymond's nephew, Roger, and massacred 20,000 of the inhabitants, Catholics as well as heretics. Simon de Montfort, who conducted the war under the legates, proceeded in the same relentless way with other places in the territories of Raymond and his allies. Of these, Roger of Béziers died in prison, and Peter I. of Aragon fell in battle. The conquered lands were given as a reward to Simon de Montfort, who was killed at the siege of Toulouse, 1218. Counts Raymond VI. and VII. disputed the possession of their territories with his son. But the papal indulgences drew fresh crusaders from every province of France to continue the war. Raymond VII. continued to struggle bravely against the legates and Louis VIII. of France, to whom Montfort had ceded his pretensions. After many thousands had perished on both sides, a peace was concluded, in 1229, at which Raymond purchased relief from the ban of the Church by immense sums of money, gave up Narbonne and several lordships to Louis IX., and had to make his son-in-law, the brother of Louis, heir to his other possessions. The Albigenses were left without a protector. The heretics were handed over to the proselytizing zeal of the order of Dominicans and the severe tribunals of the Inquisition; and both used their utmost power to bring the recusant Albigenses to the stake, and also, by inflicting severe punishment on the penitent converts, to inspire dread of incurring the Church's displeasure. From the middle of the thirteenth century the name of the Albigenses gradually disappears. The remnants of them took refuge in the east, some settling in Bosnia. Consult: Sismondi, *History of the Crusades against the Albigenses* (London, 1826); Döllinger, *Beiträge zur Sektengeschichte des Mittelalters* (Munich, 1890); Luchaire, *Innocent III. et la croisade des Albigeois* (Paris, 1905).

ALBI'NO (Portug. and Sp., from Lat. *albus*, white). A term first applied by the Portuguese to the white negroes of west Africa; now applied to any individual in whom there is congenital deficiency of pigment in skin, hair, iris, and choroid of the eye. The skin is abnormally pale, the hair is white or pale flaxen, and the iris is pink. An albino is termed *leucoëthiop* by the Latins, *kakerlak* by the Germans, *bedo* in Ceylon, and *dondo* in Africa. The absence of pigment in the iris renders an albino's eyes sensitive, and partially blind in the sunlight. Albinism, or alphosis, is found in many races as a rare condition. Cushing found it among the Zuñi. It is sometimes a family trait. It occurs frequently among rabbits, mice, birds, and other lower animals. See also Somatology; Vitiligo; Melanism and Albinism.

AL'BINOVA'NUS, Gaius Pedo. A Roman epic writer; a friend and contemporary of Ovid, who addressed to him one of his *Epistolæ ex Ponto.* In addition to his epic on the exploits of Germanicus, fragments of which are preserved in the *Suasoriæ* of Seneca, he is said to have written a poem entitled *Theseïs*, an epic on contemporary history, and numerous epigrams; but he was probably not the author of the elegy on the death of Drusus, *Epicedion Drusi*, which has been attributed to him. Albinovanus is quoted by the younger Seneca, who calls him *Fabulator Elegantissimus,* and is mentioned by Martial and Quintilian. Consult: Wernsdorf, *Poetæ Latini Minores,* Volume IV.; Bährens, *Poetæ Latini Minores,* Volume I. (Leipzig, 1879); and Haupt, *Opuscula,* Volume I. (1875).

ALBI'NUS, Clodius, the popular name for Decimus Clodius Ceionius Septimius Albinus (?-197 A.D.). A Roman commander. He was a governor of Gaul and Britain at the time of the death of the Emperor Commodus (192), and was made Cæsar by Septimius Severus in 194. After defeating his rivals, however, Severus turned his arms against Albinus, and at the battle near Lugdunum (Lyons) in Gaul (197 A.D.), Albinus was defeated and killed. (Dio. Cass. lxx. 4, *Vita Alb.*)

AL'BION AND ALBA'NIUS. An opera or masque by John Dryden, written to celebrate the successes of the Stuarts after the restoration. It was produced, with music by Louis Grabut, in 1685, and first published the same year. It is an allegory, with classical nomenclature. Albion represents Charles II., and Albanius, James, the Duke of York.

ALBION (Lat., Gk. ' λουίων *Alouïōn,* from Lat. *albus*, white, referring to the chalk cliffs of the southern coast). The most ancient name of the island of Great Britain. See Albany.

ALBION. A city in Calhoun County, Mich., 20 miles west of Jackson, on the Michigan Central, and the Lake Shore and Michigan Southern railroads, and on the Kalamazoo River (Map: Michigan, J 6). The city owns its water supply, has a city library and park, and is the seat of Albion College, under Methodist Episcopal control. Its principal manufactures are malleable iron, flour, baggage trucks, carriage and automobile seat springs, locks, hinges, screens, and agricultural implements. Albion was first settled in 1830, and is governed under a charter adopted in 1896, revised in 1897 and in 1899, which provides for a mayor, elected annually, and a city council, composed of the mayor, city clerk, and eight aldermen. Pop., 1890, 3763; 1900, 4519; 1904, 4943.

ALBION. A village, the county seat of Orleans County, N. Y., 30 miles west of Rochester, on the New York Central Railroad, and on the Erie Canal (Map: New York, B 2). The Western House of Refuge for Women, the Swan Library, the high school, the court house, Pullman Memorial Church, and Mt. Albion Cemetery are prominent features of interest. It has a canning factory and manufactures steel-stamped goods, cement building blocks, brick, etc. Albion is governed, under a revised charter of 1890, by a mayor, elected triennially, and a board of trustees. Pop., 1890, 4586; 1900, 4477; 1905, 5174.

ALBION, New. The name given by Sir Francis Drake to the western coast of North America, which he visited in 1579. It was originally applied to the whole region including the peninsula of Lower California, but was restricted by Humboldt and other geographers to the section actually explored by Drake between San Francisco Bay and the Columbia River. Consult the map in the Hakluyt Society's edition of Fletcher's *World Encompassed by Sir Francis Drake.*

AL'BION COL'LEGE. An American college, situated at Albion, Mich. It was established as a seminary in 1835, and organized as a college in 1861. In 1905 it had 26 professors and instructors, and 234 students in the college department, 218 in the schools of music, oratory, and painting, 129 in the business department, and 74 in the preparatory department. The endowment fund is $280,000, the value of buildings and grounds $200,000, and the annual income from $40,000 to $45,000. The library contains 16,000 volumes and 4300 pamphlets.

ALBION'S ENG'LAND. A long narrative poem on English history, by William Warner (c. 1558-1609). It was first published in 1586, in four books on legendary incidents from Noah's time to that of William the Conqueror; but other books were successively added, till there were sixteen, bringing the story down to the reign of James I. Many of its materials have been used by later poets.

ALBISTAN, äl'bê-stän', or **EL-BOSTAN,** ĕl' bô-stän' (Turk. The Garden). A town in the Turkish vilayet of Aleppo, about 40 miles north-northeast of Marash, on the small river of Jihun (Map: Turkey in Asia, G 3). It is situated in a fertile portion of Anatolia, and has a considerable trade in grain. Its population is about 6500.

AL'BITE (Lat. *albus,* white). A sodium feldspar or sodium aluminum silicate that crystallizes in the triclinic system. It is a constituent of many alkaline rocks, and is found extensively in the United States. Certain varieties called moonstones, having a blue chatoyant effect, are cut and polished as gems. See Feldspar.

ALBO, äl'bô, Joseph (c. 1380-1444). A Jewish preacher and theologian of Spain. He was born probably at Monreal, Aragon, studied under the speculative philosopher Hasdai Crescas, and in 1413-14 seems to have taken part in the extended theological discussion at Tortosa. He is known chiefly for his apologetic entitled, *Ikkarim* (Principles), which has exerted wide influence. The work was first published in 1485, and was translated into German by Schlesinger (1844). Consult: Back, *Joseph Albo* (1869), and Tänzer, *Die Religionsphilosophie des Joseph Albo* (1896).

ALBOIN, äl'boin (?-c. 573). The founder of the Lombard dominion in Italy. He succeeded his father in 561 A.D. as King of the Lombards, who were at that time settled in Noricum and Pannonia. He first aided Narses against the Ostrogoths, and afterward, allying himself with the Avars, attacked the Gepidæ and defeated them in a great battle (566), slaying their king, Cunimund, with his own hand. On the death of his first wife, Chlotsuinda, he married Rosamund, daughter of Cunimund. He invaded Italy in 568 with his own nation of Lombards, some of the Gepidæ, 20,000 Saxons, and adventurers from other nations; overran Venetia in 568, Liguria in 569, and Etruria in 570, and captured Beneventum in 571. Pavia was conquered in 572, after three years of siege. During a feast at Verona he made his queen drink out of the skull of her father, which he had converted into a wine-cup. In revenge she incited her paramour, Helmichis, to murder her husband (572 or 573). To escape the fury of the Lombards, Rosamund fled with her associate and the treasure to Longinus, the exarch, at Ravenna. Longinus becoming a suitor for her hand, she administered poison to Helmichis, who, discovering the treachery, caused her to swallow the remainder of the cup, and she died with him. For several centuries the name of Alboin continued to be famous among the German nations, who celebrated his praises in martial songs.

ALBONI, ȧl-bō′nė, Marietta (1823-94). An Italian contralto, born at Cesena, in the Romagna, March 10, 1823. A pupil of Mme. Bertolotti, and later of Rossini, she made her début at the age of fifteen at Bologna as Orsini in *Lucrezia Borgia*, and her success led to an engagement at La Scala, Milan. In 1846-47 she sang in all the principal cities of Europe; in London, at Covent Garden, in rivalry with Jenny Lind, who was at Her Majesty's Theatre. In 1852 she visited the United States, singing in the chief towns in opera and concert. With the exception of Malibran (q.v.), she was the greatest contralto of the nineteenth century. Her voice, a fine contralto with a compass of two and one-half octaves, ranging as high as mezzo-soprano, possessed at once power, sweetness, fullness, and extraordinary flexibility. In passages requiring elevation and semi-religious calmness she had no peers, owing to the moving quality of her voice. She possessed vivacity, grace, and charm as an actress of the *comédienne* type, but her attempt at a strongly dramatic part, like Norma, turned out a failure. She married Count Pepoli, of the Papal States, but kept her maiden name on the stage, appearing in opera at Munich as late as 1872. Her husband died in 1866, and in 1877 she married M. Zieger, a French officer. She died at Ville d'Avray, near Paris. Consult G. T. Ferris, *Great Singers* (New York, 1893), which gives a most picturesque account of her professional career.

ALBORNOZ, ȧl-bōr′nôth, Gil Alvarez Carillo de (c. 1310-1367). A warlike Spanish prelate. He was born at Cuenca, studied at Toulouse, and subsequently became almoner to Alfonso XI., King of Castile, who appointed him Archdeacon of Calatrava and finally Archbishop of Toledo. He took part in the wars against the Moors, saved the life of the King in the battle of Tarifa, and was present at the siege of Algeciras, where the King dubbed him knight. On account of the boldness with which he denounced the criminal excesses of Peter the Cruel, he fell into disgrace, and fled to Pope Clement VI. at Avignon, who made him a cardinal. Innocent VII. also recognized his abilities as an astute diplomat and sent him as cardinal-legate to Rome, where, by his tact and vigor, he secured, in spite of the intricate complications of affairs, the restoration of the papal authority in the States of the Church (1353-60). Pope Urban V. owed the recovery of his dominions to him, and out of gratitude appointed him legate at Bologna, in 1367. In the same year he died, at Viterbo; but as he had expressed a wish to be buried at Toledo, Henry of Castile removed his body with almost royal honors, and Urban even granted an indulgence to all who had assisted in transferring the body from Viterbo to Toledo. He left a valuable work upon the constitution of the Roman Church, printed for the first time at Jesi in 1473, and now very rare. By his will he provided for the foundation of the College of Spain at Bologna.

ALBRECHT, äl′brĕKt. See Albert.

ALBRECHTSBERGER, äl′brĕKts-bĕrK′ẽr, Johann Georg (1736-1809). An Austrian musician, one of the most learned contrapuntists of his age. In 1772 he was appointed court organist, and in 1792 kapellmeister of St. Stephen's cathedral. Among his pupils were Beethoven (whose genius he failed to recognize), Hummel, Moscheles, Seyfried, and Weigl. Of his numerous compositions, few are performed nowadays. His most important contributions to music were his theoretical works, the *Gründliche Anweisung zur Komposition* (1818), and *Kurzgefasste Methode, den Generalbass zu erlernen* (1792), which are still valuable.

ALBRET, ȧl′brȧ′, Jeanne d' (1528-72). Queen of Navarre, only daughter of Henry II. of Navarre, and Margaret, sister of Francis I. Jeanne married Antoine de Bourbon. She was celebrated for her intellectual strength and personal beauty. She embraced Calvinism, and, in spite of Spanish menaces and Roman intrigue, kept her possessions. In 1567 she declared the reformed religion established in the kingdom, and in 1569, with her children, Henry, afterward Henry IV. of France, and Catherine, she brought a small band of Huguenots to Coligny at La Rochelle, and after the murder of the Prince of Condé she was looked upon as the only support of the Protestants. She wrote prose and verse, and some of her sonnets have been published. Consult: *Mémoires et poésies de Jeanne d'Albret* (Paris, 1893); Freer, *Life of Jeanne d'Albret* (London, 1855).

ALBRIGHT, ạl′brīt, Jacob (1759-1808). The founder of the Evangelical Association (q.v.). He was born near Pottstown, Pa., May 1, 1759, and died at Mühlbach, Pa., May 8, 1808. In 1792 he joined the Methodist Church, in 1796 began his very successful career as preacher among the Germans, and in 1807 was elected first bishop of the church which he founded.

ALBRIGHT BRETH′REN. See Evangelical Association.

ALBRIZZI, ȧl-brĕt′sė, Isabella Teotochi, Countess d' (1763-1836). An Italian author. She was born at Corfu, of Greek parentage. As the wife of the inquisitor of state, Count Giuseppe Albrizzi, her home in Venice became the rendezvous for many celebrities of the day, such as Alfieri, Foscolo, and Byron. With Cicognara, she was one of the first to call attention to the genius of Canova, to whom she paid a glowing tribute in her celebrated work, *Opere di scultura e di plastica di Ant. Canova descritte da J. A.* (Florence, 1809); also published under the title *Descrizione delle opere di Canova*, 5 volumes (Pisa, 1821-25). Her other writings include *Ritratti* (Brescia, 1807; Pisa, 1826); seventeen essays on distinguished contemporaries, and a life of Vittoria Colonna (Venice, 1836).

ALBRU'NA. A German seer of the time of the Roman Emperor Augustus. She is mentioned by Tacitus (*Germania*, VIII.), and is supposed to have acquired renown during the campaigns of Drusus and Tiberius. Albruna is the same as the Old Norse *alfruna*, and the Anglo-Saxon *helrun*, and is the collective term for the wise women of the ancient Germans.

AL'BUCA'SIS. See ABULCASIM.

ALBUERA, ȧl-bwā'rȧ. A hamlet in the Spanish province of Badajoz. It is insignificant in itself, but famous for the battle of May 16, 1811, between the combined English, Spanish, and Portuguese forces under General Beresford, and the French under Marshal Soult, who were not so numerous as the allies, but had abundant artillery. The object of the French was to compel the English to raise the siege of Badajoz. The result was that Soult was obliged to retreat to Seville with the loss of 8000 men; the loss of the allied forces was about 7000. In proportion to the numbers engaged, the battle was the most sanguinary in the whole contest. The French had at first got possession of a height which commanded the whole position of the allied army, but they were driven from it by 6000 British, only 1500 of whom reached the top unwounded.

ALBUFERA, äl'bōō-fä'rȧ (Ar. *al*, the + *buhaira*, coast-lake). A lake near Valencia, in Spain, about 10 miles in length and the same in breadth. It is separated from the sea by a narrow tongue of land, and a canal connects it with the city of Valencia (Map: Spain, E 3). It is rich in fish and fowl, and is said to have been excavated by the Moors. From it Marshal Suchet (q.v.) took the title of duke.

ALBU'GO. See LEUCOMA.

ALBULA, äl'bōō-lȧ. A river in the canton of Grison, or Graubünden, Switzerland (Map: Switzerland, D 2). The Albula is the largest tributary of the Hither Rhine, and rises in the Albula Pass, flowing through the Albula Valley to empty into the Hither Rhine after a course of 29 miles. Its outlet is 4500 feet lower than its source.

ALBULA PASS. A high, rocky pass in which rises the Albula River, Switzerland (Map: Switzerland, D 2). It is situated 7600 feet above sea level, and lies between the peak of Crasta Mora (9600 feet high) and the Pitz Urtsch or Albulahorn (10,700 feet high). Over it runs the road from Tiefenkasten to Ponte, the shortest route into the Engadine. A railroad has recently been constructed.

AL'BUM (Lat. neut. of *albus*, white). Among the Romans, a wooden tablet whitened with gypsum, on which were written in black letters the *Annales Maximi* of the pontifex, edicts of the prætor, and public announcements of the magistrates generally. The word was also applied to the contents of such a board, and as lists of corporations had to be published, album came to denote any such catalogue; e.g., *Album Senatorium*, the official list of the Senate. In the Middle Ages the word was used to denote any list, catalogue, or register, whether of saints, soldiers, or civil functionaries. In the gymnasia and universities on the Continent, the list of the names of the members is called the album. The name is also applied to the "black board" on which public notifications of lectures, etc., are written up. But its popular signification in modern times is that of a book for containing photographs, or a blank book for a drawing-room table, intended to receive the fugitive pieces of verse, or the signatures of distinguished persons, or sometimes merely drawings.

ALBU'MEN (Lat., the white of an egg, from *albus*, white). In plants, a name formerly applied to the nutritive tissue of seeds, now commonly known as "endosperm." See SEED.

ALBUMEN, or **ALBUMIN.** The most important ingredient in the white of egg. It abounds in the blood and more or less in all the serous fluids of the animal body. It also exists in the sap of vegetables, and in their seeds and edible parts. Albumen is often used as a mordant, to fasten various colors on cotton. It is prepared industrially in considerable quantities by drying the white of egg without allowing it to coagulate. For this purpose the white of egg is placed in shallow vessels and kept at a temperature of about 50° C. (122° F.) in well-ventilated chambers. Unless coagulation has taken place, the dried albumen remains completely soluble in water. Albumen is also used in photographic printing, and its property of coagulating with heat into an insoluble variety renders it useful in clarifying solutions, as in sugar refining. With corrosive sublimate (bichloride of mercury) and other poisonous salts, albumen forms insoluble compounds; it is, therefore, often used in medicine as an antidote. See ALBUMINURIA.

ALBU'MINOIDS. See PROTEIDS.

AL'BUMINU'RIA (Lat. *albumen* + Gk. *οὖρον*, *ouron*, Lat. *urina*, urine). Generally, a symptom of disease of the kidneys; notably Bright's disease (nephritis). It consists of the presence of albumen in the urine. Tests for albuminuria: (1) Pour into a small test tube a little fresh urine, then gently add about one-half the same amount of cold nitric acid. The presence of a white ring at the junction of the liquids indicates albumen. (2) Partly fill a test tube with fresh urine; add a few drops of acetic acid; boil the top of the liquid. Coagulation indicates the presence of albumen. Physiological albuminuria occurs in young adults, after muscular exercise, and also in some people after cold baths and during indigestion. It may not be present, even in severe Bright's disease, and it is not always an indication of disease. See BRIGHT'S DISEASE.

ALBUÑOL, äl'bōō-nyōl'. A town of Spain, in the province of Granada, 41 miles southeast of Granada, and about 3 miles from the coast of the Mediterranean (Map: Spain, D 4). It is a well-built town, with clean, paved streets. The surrounding district abounds in vineyards, and is also very productive of figs and almonds. The making of wine and brandy and the drying of raisins are the chief occupations of the inhabitants of the town itself. Pop., 1900, 9356. The port of Albuñol is a small place called Negra.

ALBUQUERQUE, äl'bōō-kĕr'kȧ (Sp. from Lat. *albus*, white + *quercus*, oak-tree). A town of Estremadura, Spain, in the province of Badajoz, 24 miles north of Badajoz, and about 10 miles from the Portuguese frontier (Map: Spain, B 3). It was once fortified. Cotton and woolen fabrics are manufactured, and a considerable woolen trade is maintained. Pop., 1900, 6238.

ALBUQUERQUE. The largest city of New Mexico and the county seat of Bernalillo County, on the Rio Grande, 60 miles (direct) southwest of Santa Fe, and on the Atchison, Topeka, and Santa Fe, and the Santa Fe and Pacific railroads (Map: New Mexico, E 2). It has an elevation of 5000 feet above the sea, is the seat of the University of New Mexico (organized 1889), a government school for Indians (founded in 1881), Saint Joseph's Hospital, and several academies. The lumber interests are very extensive, and there are railroad shops, a woolen mill, a tie-preserving plant, flouring mills, foundries, and machine shops, cigar factories, mineral water establishments, etc. The city also carries on a large trade in wool. Albuquerque was founded in 1706, was named in honor of Albuquerque, then viceroy of New Mexico, and was a prominent settlement during the Spanish régime. The new town really dates from 1880, and was incorporated as a city in 1892. The mayor is elected annually, and the city council is composed of eight members. Pop., 1900, 6238; 1906 (local est.), 15,000.

ALBUQUERQUE, Affonso de, The Great (1453-1515). Viceroy of the Portuguese Indies. He was born at Alhandra, a town near Lisbon, and is known in the national epics as "the Portuguese Mars" and as "the Portuguese Cæsar." Albuquerque spent his youth in attendance at the palace of King Alfonso V. He took part in the expedition against the Turks, which terminated in the victory of the Christians at Otranto in 1481. In 1489 he became chief equerry to King John II. He was assigned to duty on the Indian fleet of 1503, and acquitted himself with such discretion that King Emanuel appointed him viceroy of the Portuguese possessions in the East in 1506. His predecessor, Francisco de Almeida (q.v.), refused to give up his office, however, and sent Albuquerque as a prisoner to Cananore. In October, 1509, he was released, and took over the authority of the viceroy. Albuquerque captured the fortress of Goa, February 16, 1510, but was forced to evacuate it and retire to Panjim, where he awaited reënforcements from Europe, with whose help, on November 26, 1510, he recaptured the city, which has ever since been the chief seat of Portuguese power and commerce in the East. He gradually completed the conquest of Malabar, Ceylon, the Sunda Isles, the peninsula of Malacca, and (in 1515) the island of Ormuz, at the entrance of the Persian Gulf. He made the Portuguese name respected in the East, and many of the princes, especially the kings of Siam and Pegu, sought his alliance and protection. He maintained strict military discipline, was active, humane, respected, feared by his neighbors, and beloved by his subjects. Notwithstanding his valuable services, Albuquerque did not escape the envy of the courtiers and the suspicions of King Emanuel, who appointed Lopez Soarez, a personal enemy of Albuquerque, to supersede him as viceroy. This ingratitude affected him deeply. Ishmaël, the Shah of Persia, offered his assistance to resist the arbitrary decree of the Portuguese court, but Albuquerque would not violate his allegiance. A few days afterward, commending his son to the king in a short letter, he died at sea near Goa, December 16, 1515. Emanuel honored his memory and raised his son to the highest dignities in the State. This son, whose name, Braz, or Blasius, was altered to Affonso after his father's death, compiled from the official despatches and private letters of the viceroy the *Commentarios do Grande Affonso d'Alboquerque* (printed in Lisbon in 1557; reprinted in 1576 and 1774). A translation, edited by W. de G. Birch, published by the Hakluyt Society of London, in four volumes, 1875-84, is the standard authority for this period of Indian history.

ALBUR'NUM (Lat. sap-wood, from *albus*, white). An old name for the sap-wood of ordinary trees (Dicotyledons and Conifers). As the tree adds new layers of wood, the ascending sap abandons the deeper seated layers, which also become modified through age. This leads usually to a sharp contrast in the appearance of the two regions, the outer region traversed by the sap (alburnum) being lighter in color and consisting of thinner-walled cells than does the older heart wood or "duramen." See Wood.

ALBURY, ąl'bĕr-ĭ. A town of New South Wales, on the Murray River, connected with Victoria by two bridges (Map: New South Wales, D 5). The Murray is navigable by steamers to Albury, 1800 miles from the river's mouth and 190 miles by rail from Melbourne. The town is well known for the wines made in the surrounding districts, from which it also derives considerable trade in agricultural and mineral produce. Pop. (1901), 5821.

ALCÆ'US (Gk. Ἀλκαῖος, *Alkaios*). One of the first lyric poets of Greece, and contemporary with Sappho. He was a native of Mitylene, and flourished at the end of the seventh and the beginning of the sixth century B.C. Alcæus was of aristocratic birth, and became a leader against the tyrants of his native city, Myrsilus and Melanchrus. Banished from home, he traveled, it is said, as far as Egypt. While he was absent, a former comrade in arms, Pittacus, was called to the head of the State by the people, whereupon Alcæus took up arms against him as a tyrant; but in attempting to force his way back he was captured by Pittacus, who, however, generously granted him life and freedom. Alcæus's odes in the Æolic dialect—arranged in ten books by the Alexandrians—contained political songs bearing on the struggles against the tyrants, hymns, and drinking and love songs. Only fragments remain. Alcæus invented the form of stanza which is named after him, the Alcaic; this Horace, the most successful of his imitators, transplanted into the Latin language. The fragments were collected in Bergk's *Poetæ Lyrici Græci*, iii.: fourth edition, pp. 147ff. (Leipzig, 1882). Consult Smyth, *Greek Melic Poets* (New York, 1900).

ALCA'ICS. Certain kinds of Greek and Latin logaœdic verse, named from the poet Alcæus (q.v.), their reputed inventor. The greater Alcaic consists of a preliminary syllable (*anacrusis*), a trochaic dipody, cyclic dactyl, and trochaic dipody catalectic. In Horace the second foot is regularly an irrational spondee,

≥ ⋮ – ⏑ | – ≥ | – ⏑ ⏑ | – ⏑ | – ∧

The lesser Alcaic is composed of two cyclic dactyls and a trochaic dipody acatalectic,

– ⏑ | ≥

The Alcaic stanza consists of two greater Alcaics, a trochaic quaternarius, with anacrusis, and a lesser Alcaic.

Ius ⋮ tum et te|nacem | proposi|ti vi|rum
non ⋮ civium | ardor | prava iu | bentium,
non ⋮ voltus | instan|tis ty | ranni
mente qua|tit soli|da, neque | Auster

ALCAIDE, ăl-kād′; *Sp. pron.* äl-kī′ᴅå (Sp. from Ar. *al*, the + *qāid*, governor), or **ALCAYDE.** A Moorish title, applied by Spanish and Portuguese writers to a military officer having charge of a fortress, prison, or town. It has also been used to designate a jailer. It is to be distinguished from alcalde, which indicates a civil officer.

ALCALÁ DE GUADAIRA, äl′kå-lä′ då gwå-ᴅī′rå (Ar. *al*, the + *Kal'at*, *Kal'ah*, castle + Sp. *de*, of). The ancient Carthaginian Hienippa (place of many springs). A town of Andalusia, Spain, in the province of Seville, seven miles east by south of Guadaira, partly on a hill, and overlooked by the ruins of an ancient Moorish castle, once one of the most important, as its ruins are still among the finest, in Spain (Map: Spain, C 4). The town is beautifully situated, and on account of the salubrity of the climate is much resorted to as a summer residence by the inhabitants of Seville. It is celebrated for producing the finest bread in Spain; there are numerous bakeries in the town and Seville is chiefly supplied from it. Seville is also supplied with water from the hill above Alcalá, which is perforated by tunnels, forming underground canals. Some of the tunnels are believed to be Roman works, but most of them are known to have been made by the Moors. Pop., 1900, 8287.

ALCALÁ DE HENARES, å-nä′rĕs. An old town in Spain, in the Province of Madrid, situated on the Henares, 22 miles from the city of Madrid (Map: Spain, D 2). It formerly had a university, which was founded by Cardinal Ximenes in 1510, and once enjoyed a world-wide fame, second to that of Salamanca alone. In 1836 the university, together with its library, was removed to Madrid. In this library was deposited the original of the celebrated polyglot Bible, which was printed in this town, and called the Complutensian, from the ancient name of the place (Complutum). Alcalá de Henares has, besides, a cavalry school, a collegiate church, and a prison for eight hundred female convicts, the only institution of its kind in Spain. Its industries include a linen thread factory, soap works, weaving mills of various kinds, and a great leather factory. It is the birthplace of Cervantes. Pop., 1900, 12,056. Consult: Calleja, "Bosquejo Histórico de los Colegios Seculares de la Universidad de Alcalá de Henares," in Volume CXVI. *Revista Contemporanea* (Madrid, 1899).

ALCALÁ LA REAL, lä rå-äl′ (Ar. *al*, the + *Kal'at*, *Kal'ah*, castle, fortress, and Sp. *la*, the + *real*, royal). A city of Andalusia, Spain, in the province of Jaen, 26 miles northwest of Granada (Map: Spain, D 4). It is situated on a conical hill, in a narrow valley, on the north side of the mountains which separate the province of Jaen from that of Granada, at an elevation of nearly 3000 feet above the sea. It is a very picturesque town, irregularly built, with steep and narrow streets and bold towers. It has a hospital, formerly an abbey, a very fine building. The neighborhood produces grain and fruits of the finest quality, and the inhabitants of the town are mostly engaged in agriculture. There is some trade in wine and wool. Pop., 1900, 15,948. The town obtained its name from the fact that it was originally the Moorish castle and stronghold of Ibn Zaide. In 1340 the place was captured by Alfonso XI.

ALCALDE, ål-käl′då (Sp., from Ar. *al*, the + *qādī*, judge). The general title of judicial and magisterial office. Still used in Spain and in countries in America settled by the Spaniards. The mayor of the *pueblo* or town is called the alcalde, and is invested with judicial as well as executive powers.

ALCAM′ENES (Gk. Ἀλκαμένης, *Alkamenēs*). A famous Athenian sculptor, said to have been a pupil of Phidias. His latest work is dated in 403 B.C., but his most famous works seem to have been executed from 440 to 430 B.C. His greatest achievement was the "Aphrodite in the Garden" at Athens, of which the "Venus Genetrix" statues are probably copies. If Pausanias is right in attributing to Alcamenes the sculptures in the west pediment of the temple of Zeus, at Olympia, and a statue of Hera in a temple destroyed by the Persians, we must assume that there was also an elder sculptor of the same name.

ALCAMO, ăl′kå-mō. A city in Sicily, 835 feet above the sea, 5 miles south of the Gulf of Castellamare, and 52 miles by rail, plus 5 miles by highway, southwest of Palermo (Map: Italy, H 9). It has an Oriental appearance in spite of the fact that in 1233, after an insurrection, Frederick II. substituted a Christian for the Saracenic population. The campanile of the cathedral contains a "Crucifixion" by Gagini; the church of San Francesco, statues of the Renaissance period; and the church Dei Minori, a "Madonna" by Rozzolone. Above the town to the south towers Mount Bonifato to the height of 2700 feet, from which is a magnificent prospect of the gulf to the north. The country is agriculturally rich. Pop. 1881, 37,697; 1901, 51,809. Consult "Documenti sulle chiese di Alcamo" in *Archivo Storico Siciliano*, Vol. XXV. (Palermo, 1900).

ALCANDRE, ål′käɴ′dr′. In Mademoiselle de Scudéry's *Clélie, Histoire Romaine*, a character representing the young Louis XIV.

ALCÁNTARA, ål-kän′tå-rä (Ar. *al*, the + *kanṭarah*, bridge). The Norba Cæsarea of the Romans. An old fortified Spanish town, built by the Moors in the province of Estremadura (Map: Spain B 3). It is noted for the bridge, which was built by Trajan early in the second century. This is 670 feet long and 210 feet high, with six arches, and was constructed of stone without cement. In 1808 the English partially destroyed the bridge, and it suffered again in the civil war of 1836. From that time until 1882, when it was repaired, the inhabitants used a ferry. Pop., 1900, 3097.

ALCÁNTARA, ORDER OF. A religious and military order of knighthood, established about 1156 for the defense of Estremadura against the Moors. In 1197, Pope Celestine III. confirmed the privileges of the order, imposing the oaths of obedience, poverty, chastity, and eternal war against the Moors. The order was at first known as the Knights of St. Julian, but in 1217 Alfonso IX. gave them the town of Alcántara, which he had taken from the Moors. They settled in this town, and were known as the Order of Alcántara. In time the grand mastership of the Order was united to the Spanish crown by Pope Alexander VI., in 1495, when the former Grand Master was made Archbishop of Toledo and a cardinal. In 1546 the knights were allowed to marry, but were obliged to take an oath to defend the Immaculate Conception. For a time in their early history the Knights of Alcántara acknowledged the superiority of the Knights of Calatrava, but later were independent. In 1835 the Order ceased to exist as an ecclesiastical body and became an order of the court.

ALCANTARA. A seaport town of Brazil, in the State of Maranhão, 17 miles northwest of Maranhão, near the mouth of the bay of S. Marcos (Map : Brazil, J 4). It was formerly the capital of the province, but the shallowness of the harbor has prevented its trade from increasing. There are two salt-pits not far from the town. Cotton, rice, and salt are exported. Pop., about 10,000.

ALCANTARA. A western suburb of Lisbon, where, in 1580, the invading Duke of Alva won a victory over the Portuguese. It is now a part of the city.

ALCANTARA, Doctor of. An opera by Julius Eichberg (q.v.), first presented in Boston in 1862.

ALCARAZ, äl′kȧ-räth′. A town of La Mancha, Spain, in the province of Albacete, 36 miles west-southwest of Albacete (Map: Spain, D 3). It stands on the slope of an isolated hill, on the left bank of the Guadarmena, a feeder of the Guadalquivir. A ruined castle crowns the summit of the hill, and there are also the remains of a fine Roman aqueduct. The town owes its importance to the well-known tin and zinc mines in the vicinity, which give employment to its inhabitants. Pop., 1900, 4503.

ALCATRAZ′, or **PEL′ICAN IS′LAND.** An island in the bay of San Francisco, nearly 3 miles northwest of the city. It is 1650 feet in length, and it rises 130 feet above the level of the bay. The United States Government maintains upon it an important fortification, which commands the entrance to the Golden Gate. On its highest ground has been erected the highest lighthouse on the Pacific coast.

ALCAVALA, äl′kȧ-vä′lȧ, or **ALCABALA** (Sp. from Ar. *al*, the + *qabālah*, duty, tax). A duty formerly charged in Spain and her colonies on transfers of property, whether public or private. It was probably instituted in 1341 by Alfonso XI., beginning with 5 per cent., and by the seventeenth century had increased to 14 per cent. of the selling price of all commodities, raw or manufactured, charged as often as they were sold or exchanged. This impost was enforced, despite its ill effect on the commerce of the kingdom, down to the invasion of Napoleon, and indeed, in a modified form, has been continued to the present day. Catalonia and Aragon purchased from Philip V. exemption from the tax, and, though still burdened heavily, were in a flourishing state in comparison with districts covered by the alcavala.

ALCÁZAR, ȧl-kä′zär; *Sp. pron.* ȧl-kä′thär (Sp. from Ar. *al*, the + *ḳaṣr*, palace, castle). The name given in Spain to the large palaces built by the Moors, especially royal palaces, or those of great emirs. They are often even more in the nature of strongholds than the Florentine palaces, being built around one or more large colonnaded courts, with towers at the angles, heavy high walls, and a single double gateway. Several still exist in the large Spanish cities, dating from Moorish times, as at Malaga, Seville, Toledo, and Segovia. The alcazar differs from the real fortress palace or acropolis fort, called "kal'at" (such as the Alhambra), in being within, instead of outside, the city streets. The term would apply, however, to any palace throughout Mohammedan countries. The best preserved imitation in Christian art of this type is the princely palace at Ravello, near Naples, built under the influence of Mohammedan art.

ALCÁZAR DE SAN JUAN, ȧl-kä′thär dȧ sän hwän′. A town of Spain, in the province of Ciudad Real, situated 92 miles by rail from Madrid (Map: Spain, D 3). It lies in a mountainous region in the vicinity of extensive iron mines. It has a number of soap, powder, and saltpetre factories, and carries on a large trade in wine. The environs of Alcázar are believed to have been described by Cervantes in *Don Quixote.* Pop., 1900, 11,292.

ALCE′DO (Lat.), **ALCY′ONE** (Gk. Ἀλκυόνη, *Alkyonē*). The names of genera of kingfishers, in allusion to a classic myth. See Alcyone and Kingfisher.

ALCEDO Y HERRERA, ȧl-thā′dô ê ȧr-rā′rȧ, Antonio. A Peruvian soldier and historian, whose *Diccionario geográfico-histórico de las Indias Occidentales*, published at Madrid in four volumes (1786-89), supplies much exclusive information concerning the middle period of Spanish-American history. The original work was suppressed by the Spanish government. An English translation by G. A. Thompson (London, 1812-15) contains considerable additions. Alcedo was also the compiler of an important bibliographical work, the *Biblioteca Americana*, the numerous manuscript copies of which are frequently cited by writers on early American bibliography.

ALCESTE, ȧl′sĕst′. (1) A character in Molière's play entitled *Le Misanthrope* (q.v.). (2) A name used as a pseudonym by a number of modern French writers, among them Amédée Achard, Alfred Assolant, Louis Belmontet, Hippolyte de Castille, and Édouard Laboulaye. (3) A tragic opera by Gluck, first performed with an Italian text, December 16, 1766, at Vienna. Ten years later it was produced in French at Paris.

ALCESTER, ąl′stẽr, Frederick Beauchamp Paget Seymour, Baron (1821-95). An English admiral. He was born in London, educated at Eton, and entered the navy in 1834. He became a captain in 1854, a rear admiral in 1870, and an admiral in 1882. In 1880 he was in command of the allied fleet which made a demonstration off the Albanian coast in order to compel the Turks to cede Dulcigno to Montenegro. For this service he was created G.C.B. In the Egyptian war of 1882 he commanded the British fleet at the bombardment of Alexandria. He was raised to the peerage later in the same year.

ALCES′TIS. See Admetus.

AL′CHEMIL′LA. See Lady's Mantle.

AL′CHEMIST, The. A noted comedy by Ben Jonson, acted in 1610, printed in 1612. It makes a jest of the then popular belief in the philosopher's stone and the elixir of life; its leading character, Subtle, is a quack who deludes Sir Epicure Mammon and other credulous persons till he is finally exposed.

AL′CHEMY (Ar. *al*, the + *kīmiyā*, from late Gk. *χημ[ε]ία, chēm[e]ia;* see below). Alchemy is to modern chemistry what astrology is to astronomy, or legend to history. In the eye of the astrologer, a knowledge of the stars was valuable as a means of foretelling, or even of influencing, future events. In like manner, the genuine alchemist toiled with his crucibles and alembics, calcining, subliming, distilling, with two grand objects, as illusory as those of the astrologer—to discover, namely, (1) the secret of transmuting the baser metals into gold and silver, and (2) the means of indefinitely prolonging human life.

Tradition points to Egypt as the birthplace of the science. The god Hermes Trismegistus is represented as the father of it; and the most probable etymology of the name is that which connects it with the most ancient and native name of Egypt, *Chemi* (the Scripture Cham or Ham). The Greeks and Romans under the empire would seem to have become acquainted with it from the Egyptians: there is no reason to believe that in early times either people had the name or the thing. *Chemia* (Gk. *χημεία, chēmeia*) occurs in the lexicon of Suidas, written about the eleventh century, and is explained by him to be "the conversion of silver and gold." It is to the Arabs, from whom Europe got the name and the art, that the term owes the prefixed article *al.* As if *chemia* had been a generic term embracing all common chemical operations, such as the decocting and compounding of ordinary drugs, the grand operation of transmutation was denominated *the chemia* (*al-chemy*)—the chemistry of chemistries. The Roman Emperor Caligula is said to have instituted experiments for the producing of gold out of orpiment (sulphide of arsenic); and in the time of Diocletian, the passion for this pursuit, conjoined with magical arts, had become so prevalent in the Empire, that that Emperor is said to have ordered all Egyptian works treating of the chemistry of gold and silver to be burned. For at that time multitudes of books on this art were appearing, written by Alexandrine monks and by hermits, but bearing famous names of antiquity, such as Democritus, Pythagoras, and Hermes.

At a later period, the Arabs took up the art, and it is to them that European alchemy is directly traceable. The school of polypharmacy, as it has been called, flourished in Arabia during the caliphate of the Abbassides. The earliest work of this school now known is the *Summa Perfectionis*, or "Summit of Perfection," composed by Geber (q.v.) about the eighth century; it is consequently the oldest book on chemistry proper in the world. It contains so much of what sounds very much like jargon in modern ears, that Dr. Johnson ascribes the origin of the word "gibberish" to the name of the compiler. Yet, when viewed in its true light, it is a wonderful performance. It is a kind of text-book, or collection of all that was then known and believed. It appears that these Arabian polypharmists had long been engaged in firing and boiling, dissolving and precipitating, subliming and coagulating chemical substances. They worked with gold and mercury, arsenic and sulphur, salts and acids, and had, in short, become familiar with a large range of what are now called chemicals. Geber taught that there are three elemental chemicals—mercury, sulphur, and arsenic. These substances, especially the first two, seem to have fascinated the thoughts of the alchemists by their potent and penetrating qualities. They saw mercury dissolve gold, the most incorruptible of matters, as water dissolves sugar; and a stick of sulphur presented to hot iron penetrates it like a spirit, and makes it run down in a shower of solid drops, a new and remarkable substance, possessed of properties belonging neither to iron nor to sulphur. The Arabians held that the metals are compound bodies, made up of mercury and sulphur in different proportions. With these very excusable errors in theory, they were genuine practical chemists. They toiled away at the art of making "many medicines" (polypharmacy) out of the various mixtures and reactions of such chemicals as they knew. They had their pestles and mortars, their crucibles and furnaces, their alembics and aludels, their vessels for infusion, for decoction, for cohobation, sublimation, fixation, lixiviation, filtration, coagulation, etc. Their scientific creed was transmutation, and their methods were mostly blind gropings; and yet, in this way, they found out many a new substance and invented many a useful process.

From the Arabs, alchemy found its way through Spain into Europe, and speedily became entangled with the fantastic subtleties of the scholastic philosophy. In the Middle Ages, it was chiefly the monks who occupied themselves with alchemy. Pope John XXII. took great delight in it, though it was afterward forbidden by his successor. The earliest authentic works on European alchemy now extant are those of Roger Bacon (died about 1294) and Albertus Magnus. Bacon appears rather the earlier of the two as a writer, and is really the greatest man in all the school. He was acquainted with gunpowder. Although he condemns magic, necromancy, charms, and all such things, he believes in the convertibility of the inferior metals into gold, but does not profess to have ever effected the conversion. He had more faith in the elixir of life than in gold-making. He followed Geber in regarding potable gold—that is, gold dissolved in nitro-hydrochloric acid or *aqua regia*—as the elixir of life. Urging it on the attention of Pope Nicholas IV., he informs his Holiness of an old man who found some yellow liquor (the solution of gold is yellow) in a golden vial, when plowing one day in Sicily. Supposing it to be dew, he drank it off. He was thereupon transformed into a hale, robust, and highly accomplished youth. Bacon no doubt took many a dose of this golden water himself. Albertus Magnus had a great mastery of the practical chemistry of his times; he was acquainted with alum, caustic alkali, and the purification of the royal metals by means of lead. In addition to the sulphur-and-mercury theory of the metals, drawn from Geber, he regarded the element water as still nearer the soul of nature than either of these bodies. He appears, indeed, to have thought it the primary matter, or the radical source of all things—an opinion held by Thales, the father of Greek speculation. Thomas Aquinas also wrote on alchemy, and was the first to employ the word *amalgam* (q.v.). Raymond Lully is another great name in the annals of alchemy. His writings are much more disfigured by unintelligible jargon than those of Bacon and Albertus Magnus. He was the first to introduce the use of chemical symbols, his system consisting of a scheme of arbitrary hieroglyphics. He made much of the spirit of wine (the art of distilling spirits would seem to have been then recent), imposing on it the name of ***aqua vitæ ardens.***

In his enthusiasm, he pronounced it the very elixir of life.

But more famous than all was Paracelsus, in whom alchemy proper may be said to have culminated. He held that the elements of compound bodies were salt, sulphur, and mercury—representing respectively earth, air, and water, fire being already regarded as an imponderable—but these substances were in his system purely representative. All kinds of matter were reducible under one or other of these typical forms; everything was either a salt, a sulphur, or a mercury, or, like the metals, it was a "mixt" or compound. There was one element, however, common to the four; a fifth essence or "quintessence" of creation; an unknown and only true element, of which the four generic principles were nothing but derivative forms or embodiments; in other words, he inculcated the dogma that there is only one real elementary matter—nobody knows what. This one prime element of things he appears to have considered to be the universal solvent of which the alchemists were in quest, and to express which he introduced the term *alcahest*—a word of unknown etymology, but supposed by some to be composed of the two German words *all' Geist*, "all spirit." He seems to have had the notion that if this quintessence or fifth element could be got at, it would prove to be at once the philosopher's stone, the universal medicine, and the irresistible solvent.

After Paracelsus, the alchemists of Europe became divided into two classes. The one class was composed of men of diligence and sense, who devoted themselves to the discovery of new compounds and reactions—practical workers and observers of facts, and the legitimate ancestors of the positive chemists of the era of Lavoisier. The other class took up the visionary, fantastical side of the older alchemy, and carried it to a degree of extravagance before unknown. Instead of useful work, they compiled mystical trash into books, and fathered them on Hermes, Aristotle, Albertus Magnus, Paracelsus, and other really great men. Their language is a farrago of mystical metaphors, full of "red bridegrooms," and "lily brides," "green dragons," "ruby lions," "royal baths," "waters of life." The seven metals correspond to the seven planets, the seven cosmical angels, and the seven openings of the head—the eyes, the ears, the nostrils, and the mouth. Silver was Diana, gold was Apollo, iron was Mars, tin was Jupiter, lead was Saturn, etc. They talk forever of the power of attraction, which drew all men and women after the possessor; of the alcahest, and the grand elixir, which was to confer immortal youth upon the student who should prove himself pure and brave enough to kiss and quaff the golden draught. There was the great mystery, the mother of the elements, the grandmother of the stars. There was the philosopher's stone and there was the philosophical stone. The philosophical stone was younger than the elements, yet at her virgin touch the grossest calx (ore) among them all would blush before her into perfect gold. The philosopher's stone, on the other hand, was the first-born of nature, and older than the king of metals. Those who had attained full insight into the arcana of the science were styled wise; those who were only striving after the light were philosophers; while the ordinary votaries of the art were called adepts. It was these visionaries that formed themselves into Rosicrucian societies and other secret associations. It was also in connection with this mock alchemy, mixed up with astrology and magic, that quackery and imposture so abounded, as is depicted by Scott in the character of Dousterswivel in the *Antiquary*. Designing knaves would, for instance, make up large nails, some of iron and some of gold, and lacquer them, so that they appeared common nails, and when their credulous and avaricious dupes saw them extract from what seemed plain iron an ingot of gold, they were ready to advance any sum that the knaves pretended to be necessary for applying the process on a large scale. It is from this degenerate and effete school that the prevailing notion of alchemy is derived—a notion which is unjust to the really meritorious alchemists who paved the way for the modern science of chemistry. Priestley, Lavoisier, and Scheele, by the use of the balance, tested the results of alchemy, and thence the fundamental ideas of modern chemistry were born; but the work had already been begun by men of genius, such as Robert Boyle, Bergmann, and others. It is interesting to observe that the doctrine of the transmutability of metals—a doctrine which it was at one time thought that modern chemistry had utterly exploded—receives not a little countenance from a variety of facts every day coming to light; not to speak of the periodic law of the elements, which, while separating the elements as a class from all other chemical substances, seems to indicate the existence of unknown relations between the elements themselves. Consult: J. von Liebig, *Familiar Letters on Chemistry*, original in German, exists in translations (London, 1851); F. Höfer, *Histoire de la chimie* (Paris, 1869); G. F. Rodwell, *The Birth of Chemistry* (London, 1874); M. Berthelot, *Les origines de l'alchimie* (Paris, 1885); H. Kopp, *Die Alchemie in älterer und neuerer Zeit* (1886); Muir, *The Story of Alchemy* (New York, 1904). See also CHEMISTRY.

ALCHYMIST, DER, dĕr ä̤l'kē-mēst. A German opera by Spohr, the text being by Pfeiffer, produced at Cassel, July 28, 1830. It is founded on Washington Irving's tale of *The Alchemist*.

ALCIATI, ȧl-chä'tē, ANDREA (1492-1550). An Italian jurisconsult of the Renaissance, successively professor of law in the universities of Avignon, Bourges, Bologna, Pavia, and Ferrara. He improved the method of studying Roman law, by substituting historical research for the servile forms of the glossarists. He wrote many legal works, including commentaries on the Code of Justinian and the Decretals, a history of Milan, notes on Tacitus and Plautus, and a *Book of Emblems*, or moral sayings, in Latin verse, which has been greatly admired.

AL'CIBI'ADES. A tragedy in five acts by Thomas Otway, produced in 1675 at Dorset Garden Theatre, London, with Betterton in the title rôle.

ALCIBIADES (Gk. Ἀλκιβιάδης, *Alkibiadēs*) (c. 450-404 B.C.). An Athenian politician and general. He was the son of Clinias and Dinomache, and belonged to the class of the Eupatridæ. He was born at Athens, lost his father in the battle of Coronea in 446 B.C., and was in consequence educated in the house of Pericles, his uncle. In his youth he gave evidence of his future greatness, excelling both in mental and bodily exercises. His handsome person, his distinguished parentage, and the high position of Pericles procured him a multitude of friends and admirers. Socrates was one of the former, and gained considerable influence over him; but was unable to restrain his love of luxury and dissipation, which found ample means of gratification in the wealth that accrued to him by his union with Hipparete, the daughter of Hipponicus. His public displays, especially at the Olympic Games, in 420 B.C., were incredibly expensive. He bore arms for the first time in the expedition against Potidæa (432 B.C.), where he was wounded, and where his life was saved by Socrates, a debt which he liquidated eight years after at the battle of Delium by saving, in his turn, the life of the philosopher; but he seems to have taken no considerable part in political matters till after the death of the demagogue Cleon, when Nicias brought about a treaty of peace for fifty years between the Athenians and Lacedæmonians, 421 B.C. Alcibiades, jealous of the esteem in which Nicias was held, set himself at the head of the war party, and persuaded the Athenians to ally themselves with the people of Argos, Elis, and Mantinea, and did all in his power to stir up afresh their old antipathy to Sparta. It was at his suggestion that they engaged in the celebrated enterprise against Syracuse, to the command of which he was elected, with Nicias and Lamachus. But while preparations were being made, it happened during one night that all the statues of Hermes in Athens were mutilated. The enemies of Alcibiades threw the blame of this mischief upon him, but postponed the impeachment till he had set sail, when they stirred up the people against him to such a degree that he was recalled in the autumn of 415 B.C. in order to stand his trial.

On his way home, Alcibiades landed at Thurii, fled, and betook himself to Sparta, where, by conforming to the strict manners of the people, he soon became a favorite. He induced the Lacedæmonians to send assistance to the Syracusans, persuaded them to occupy permanently a post at Decelea in Attica, to form an alliance with the King of Persia, and after the unfortunate issue of the Athenian expedition in Sicily, to support the people of Chios in their endeavors to throw off the yoke of Athens. He went thither himself, and raised all Ionia in revolt against that city. But Agis and the other leading men in Sparta, jealous of the success of Alcibiades, ordered their generals in Asia to have him assassinated. Alcibiades discovered this plot and fled to Tissaphernes, a Persian satrap, who had orders to act in concert with the Lacedæmonians. He now resumed his old manners, adopted the luxurious habits of Asia, and made himself indispensable to Tissaphernes. He represented to the latter that it was contrary to the interests of Persia entirely to disable the Athenians. He then sent word to the commanders of the Athenian forces at Samos that he would procure for them the friendship of the satrap if they would control the extravagance of the people and commit the government to an oligarchy. This offer was accepted, and in 411 B.C. Pisander was sent to Athens, where he had the supreme power vested in a council of four hundred persons. When it appeared, however, that this council had no intention of recalling Alcibiades, the army at Samos chose him as their commander, desiring him to lead them on instantly to Athens and overthrow the tyrants. But Alcibiades did not wish to return to his native country till he had rendered it some service, and he accordingly attacked and defeated the Lacedæmonians by both sea and land. Tissaphernes now ordered him to be arrested at Sardis on his return, the satrap not wishing the King to imagine that he had been accessory to his doings. But Alcibiades found means to escape, placed himself again at the head of the army, beat the Lacedæmonians and Persians at Cyzicus, took Cyzicus, Chalcedon, and Byzantium, restored to the Athenians the dominion of the sea, and then returned to his country (407 B.C.), to which he had been formally invited. He was received with general enthusiasm, as the Athenians attributed to his banishment all the misfortunes that had befallen them.

The triumph of Alcibiades, however, was not destined to last. He was again sent to Asia with one hundred ships; but, not being supplied with money for the soldiers' pay, he was obliged to seek assistance at Caria, where he transferred the command in the meantime to Antiochus, who, being lured into an ambuscade by Lysander, lost his life and part of the ships. The enemies of Alcibiades took advantage of this to accuse him and appoint another commander. Alcibiades went into voluntary exile at Pactye in Thrace, one of the strongholds which he had built out of his earlier spoils. But being threatened here with the power of Lacedæmonia, he removed to Bithynia, with the intention of repairing to Artaxerxes, to gain him over to the interests of his country. At the request of the Thirty Tyrants of Athens, and with the concurrence of the Spartans, Pharnabazus, a satrap of Artaxerxes, received orders to put Alcibiades to death. He was living at this time in a castle in Phrygia; Pharnabazus caused it to be set on fire during the night. As his victim was endeavoring to escape from the flames, he was pierced with a volley of arrows. Thus perished Alcibiades (404 B.C.), about the forty-fifth year of his age. He was singularly endowed by nature, being possessed of the most fascinating eloquence and having in a rare degree the ability to win and to govern men. Yet in all his transactions he allowed himself to be directed by external circumstances, without having any fixed principles of conduct. On the other hand, he possessed that boldness which arises from conscious superiority, and he shrank from no difficulty, because he was never doubtful concerning the means by which an end might be attained. Consult: The *Lives*, by Plutarch and Nepos: Grote, *History of Greece* (New York, 1853-56); Hertzberg, *Alkibiades, der Staatsmann und Feldherr* (Halle, 1853); Houssaye, *Histoire d'Alcibiade*, 2 volumes (Paris, 1873).

ALCI'DA: GREENE'S METAMORPHOSES. A pamphlet by Robert Greene, of which the first known edition dates from 1617, though it was licensed in 1588 and probably published soon after. It contains stories illustrating the ills that result from feminine vanities.

ALCID'AMAS (Gk. 'Αλκιδάμας, *Alkidamas*). A Greek rhetorician, pupil of Gorgias and the last of the Sophistical school. He was a native of Elæa, in Asia Minor, but between 432 and 411 B.C. gave instruction in eloquence at Athens. The only extant declamations attributed to him are: 'Οδυσσεύς, in which Odysseus accuses Palamedes of treachery to the Grecian cause during the siege of Troy: and Περὶ Σοφιστῶν, against the Sophists. The latter oration, which is said to have been directed chiefly against Isocrates, the contemporary of Alcidamas, has been published by Blass in his second edition of *Antiphon* (p. 193). Consult Bahlen, *Der Rhetor Alcidamas* (1861).

ALCI′DES. A patronymic of Hercules, from the name of his grandfather, Alcæus.

AL′CIMUS. A high priest of the Zadokite family, born about 200 B.C., and raised to power by Demetrius Soter (162 B.C.). He was a leader in the Hellenistic party which opposed the Maccabees, and is said on the occasion of the defeat of the latter (April, 160 B.C.) to have torn down the wall of the court of the inner temple at Jerusalem, probably for the purpose of rebuilding it on a more magnificent scale. See the discussions of his career in Wellhausen, *Israelitische und jüdische Geschichte* (third edition, Berlin, 1897), and Büchler, *Tobiaden und die Oniaden im II. Makkabäerbuche* (Vienna, 1899).

ALCIN′OÜS (Gk. Ἀλκίνοος, *Alkinoos*). A mythical king of the mythical Phæacians, grandson of Poseidon. His daughter, Nausicaa, rescued the shipwrecked Odysseus, who was entertained and sent home by Alcinoüs and his queen, Arete. His people are skilled seamen, but luxurious, and his domain, Scheria, a Grecian fairyland. Later tradition identified Scheria with the island of Corcyra (Corfu).

AL′CIPHRON (Gk. Ἀλκίφρων, *Alkiphrōn*). A Greek rhetorician who flourished probably about the close of the second century A.D. He was the author of 118 letters in three books, which profess to be epistles written by common people—peasants, fishermen, courtesans, and parasites. Their style is pure and their form excellent; they are valuable as character sketches, which picture clearly Athenian life of his time; and the letters of the courtesans, being based on the new comedy, especially on lost plays of Menander, assist us to recreate that literature. Edited by Meineke (Leipzig, 1853); Wagner (Paris, 1878), and Hercher, in his *Epistolographi Græci* (Paris, 1873). There is an English translation by Beloe (London, 1890).

ALCIPHRON. The hero of Thomas Moore's novel, *The Epicurean*, published in 1827, to which was appended, in 1839, the poem entitled *Alciphron*, in which the author had first taken up the theme.

ALCIPHRON, or THE MINUTE′ PHILOS′OPHER. A work by Bishop Berkeley, written at his home in Rhode Island, and published in 1732, after his return to England. It is a dialogue, in which Alciphron, a skeptic, is made the chief speaker for the sake of showing the weakness of the infidel's position.

ALCIRA, ȧl-thē′rȧ. A town of Spain, in the province of Valencia, 20 miles south by west of Valencia, on an island in the river Júcar, here crossed by fine stone bridges (Map: Spain, E 3). It is surrounded by old walls with strong towers. The principal streets are wide, but the town is ill built. The main buildings are three churches, six monasteries, and a theatre. The surrounding country is fertile, and abounds in the orange and the palm, but rice swamps fill the air with malaria. The many canals admirably illustrate the system of irrigation introduced by the Moors. The town has two fine bridges, and there is a remarkable stalactitic cavern in the vicinity. Pop., 1900, 19,906. Alcira was known in Roman times as Sætabicula, and was the chief seat of the tribe of the Contestani. The district about Alcira is sometimes called the garden of the kingdom of Valencia.

ALCMÆ′ON (Gk. Ἀλκμαίων, *Alkmaiōn*). In Greek legend, the son of Amphiaraüs (q.v.) and Eriphyle, and brother or father of Amphilochus. He was the leader of the Epigoni (q.v.), who captured Thebes to revenge the death of their fathers in the War of the Seven. As Eriphyle had betrayed her husband to his death, Amphiaraüs ordered his son to kill her. For this act, madness came upon Alcmæon, and he was pursued by the Furies. In his flight he came to Psophis, in Arcadia, whose king, Phegeus, purified him and gave him his daughter Arsinoë. Alcmæon gave her the necklace and peplus of Harmonia, the bribe of Eriphyle. Driven by the Furies, Alcmæon then went to the river-god Acheloüs, who also purified him and gave him his daughter, Callirrhoë. For her he took his gifts from his former wife under pretense of dedicating them at Delphi. When his father-in-law heard of this deceit, he sent his sons, who killed Alcmæon, but Alcmæon's sons by Callirhoë took bloody vengeance at her instigation. There are indications of a cult of Alcmæon at Psophis, where his tomb was shown, and at Thebes. Later stories told of Alcmæon's conquest of Acarnania, apparently as a mythical prototype of the Corinthian civilization of that region.

ALCMÆON (Gk. Ἀλκμαίων, *Alkmaiōn*). A Greek physician and naturalist, who lived in the last half of the sixth century B.C. He was a native of Crotona, in Italy, and is said to have been a pupil of Pythagoras. He made important discoveries in anatomy, and was the first to practice dissection. He wrote a book *On Nature*, of which we have fragments.

ALC′MÆON′IDÆ (Gk. Ἀλκμαιωνίδαι, *Alkmaiōnidai*, descendants of Alcmæon). A distinguished family in ancient Athens, whose founder, Alcmæon, according to tradition, came from Pylos, Messenia. One of them was the Archon Megacles, who, about 612 B.C., slew the conspirator Cylon and his followers at the altars where they had fled, in spite of his promise to spare them. For this sacrilege the whole family was banished, about 596 B.C. They maintained a conflict for many years with Pisistratus and his sons, however, and in 510 were finally brought back to Athens by the help of the Spartans, who were led to aid them by the partiality of the Delphic oracle. Clisthenes (q.v.), then the head of the family, was the noted legislator. Even more famous members of it were Pericles and Alcibiades.

ALC′MAN (Ἀλκμάν, *Alkman*). A poet of the second half of the seventh century B.C., who is considered the founder of Dorian lyric poetry. He was born at Sardis, the capital of Lydia, in Asia Minor, but was probably of Greek extraction. A doubtful tradition said that he was a slave; in any case, he attained to a high position at Sparta, where he made his home, and became teacher of the State choruses. In the Hellenistic period six books of his poems were current, comprising partheneia, hymns, hyporchemes, pæans, erotica, and hymenaia. He was counted the founder of erotic poetry, and reached great perfection in his partheneia. His dialect was the Dorian, but his verses show many Æolian characteristics. Alcman occupied the first place in the Alexandrian Canon. The bucolic poets regarded him as their predecessor, and we know that he was read with pleasure in the second century A.D., although his dialect was then considered harsh and unmusical. Only fragments of his poetry remain, edited in Bergk's *Poetæ Lyrici Græci*, III., fourth edition, pp. 14ff. (Leipzig, 1882); a fragment discovered in 1896 is published in *Oxyrhynchus Papyri I.*, No. VIII.

ALCME'NE (Gk. 'Αλκμήνη, *Alkmēnē*). In Greek mythology, the daughter of Electryon, King of Mycenæ, and wife of Amphitryon, mother of Heracles, by Zeus, who came to her in the form of her husband. She was the mother of Iphicles by Amphitryon.

AL'CO (native name). A small, long-haired dog of tropical America, known both wild and in a domesticated condition. In the latter state it is gentle and home-keeping; and as its ears are pendulous it is considered by most authorities as a species introduced in the early days of the Spanish conquest, and since become partly feral. Consult Gosse, *A Naturalist's Sojourn in Jamaica* (London, 1851).

ALCOBAÇA, äl'kō-bä'sȧ. A town in the province of Estremadura, Portugal, situated between the Alcoa and Baça rivers, four miles east of Vallado, the nearest railway station. On the west Alcobaça is dominated by a range of hills crowned with the ruins of a Moorish castle. The town is famous for the Cistercian abbey of Santa Maria, one of the finest and richest monasteries in the world. It contains the tombs of Inez de Castro and of some of the Portuguese kings. The buildings comprise an imposing church in early Gothic, five cloisters, seven dormitories, a library containing over 25,000 volumes, and a hospedaria. It is supplied with water by a tributary of the Alcoa, which flows through the enormous kitchen. The abbey was built from 1148 to 1222, was sacked by the French in 1810, and in 1834 was secularized. The north part of the structure is now used as a barracks for cavalry. Pop. of town, 1900, 1562.

ALCOCK, ąl'kŏk, Sir Rutherford (1809-97). An English diplomatist and author, born in London. He studied medicine, and became distinguished as an army surgeon and hospital inspector, and afterward as a lecturer on surgery. In 1844 he was sent as British consul to China, and he served in Amoy, Fuchow, and Shanghai. He won such distinction in these services that, in 1858, he was made consul general in Japan. He was accredited to the Shogun, or military mayor, who had his headquarters in Yedo, instead of to the Mikado, or true emperor, in Kioto, and was, therefore, like the other foreign ministers, continually under the menace of assassination. Twice the legation was murderously attacked, and once burned, but Alcock insisted on the literal fulfillment of the treaties. Under his influence, Shimonoseki was bombarded in 1864, after which, the Yedo government refusing to open more ports to trade, an indemnity of $3,000,000 was extorted, part of which was paid by the Mikado's government in 1874. Recalled in 1865 from Japan for his action, he was appointed minister plenipotentiary to Peking, and served from 1865 to 1871. It was Alcock who first brought Japanese art to the world's notice, in the London World's Exposition (1862). He was, from 1876, for a long time the president of the Royal Geographical Society. His publications include: *Life's Problems*; *The Capital of the Tycoon* (1863); *Art and Industries in Japan* (1878), and many geographical and other articles in periodicals. For further account of his career, consult R. J. Mitchie, *An Englishman in China During the Victorian Era* (Edinburgh, 1900).

ALCOFRIBAS NASIER, ȧl'kō'frē'bä' nȧ'-syȧ'. The pseudonym, formed anagrammatically from his own name, under which François Rabelais published his *Pantagruel*, etc.

AL'COHOL (Ar. *al*, the + *kohl*, exceedingly fine powder of antimony for painting eyebrows; hence the quintessence of something; finally rectified spirits, alcohol), or Eth'yl Alcohol, C_2H_5OH, often called spirits of wine. A chemical compound of carbon, hydrogen, and oxygen that has been known and extensively used from the earliest times. It is consumed in very large quantities in the form of intoxicating liquors, and is used for various purposes in the arts and manufactures. The alcohol of commerce, in its various forms, is all made by fermentation. Natural products containing a large amount of starch, such as grain, rice, potatoes, etc., are reduced with water to a paste, and a small quantity of malt is added to produce fermentation, by which the starch is in a short time transformed into dextrin and a kind of sugar called maltose, according to the following chemical equation:

$$\underset{\text{Starch}}{3C_6H_{10}O_5} + H_2O = \underset{\text{Dextrin}}{C_6H_{10}O_5} + \underset{\text{Maltose}}{C_{12}H_{22}O_{11}}$$

Then yeast, which consists of living plant cells, is added to set up a new process of fermentation, by which the maltose is converted into alcohol, according to the following chemical equation:

$$\underset{\text{Maltose}}{C_{12}H_{22}O_{11}} + H_2O = \underset{\text{Alcohol}}{4C_2\,H_6O} + 4CO_2$$

The manufacture of alcohol thus involves two distinct processes of fermentation; for neither can alcohol be obtained from maltose by the action of the *diastase* of malt, nor can maltose be obtained from starch by the action of yeast. Small quantities of organic substances are usually produced along with ethyl alcohol during fermentation; one of these is the well-known *fusel oil*, a mixture of alcohols chemically allied to ordinary alcohol and containing mainly amyl alcohol. A small quantity of fusel oil is contained even in the "raw spirit," a strong alcohol obtained by distilling the weak solution obtained through fermentation. To free the raw spirit from fusel oil, which is highly injurious, it is mixed with water, filtered through charcoal, and subjected to a process of fractional distillation, the intermediate fractions, called rectified spirit, being practically free from fusel oil. The presence of the latter in spirituous liquors may be readily detected by adding a few drops of colorless aniline and two or three drops of sulphuric acid, a deep-red coloration being produced in the presence of fusel oil. The flavor of alcoholic beverages is due to the presence of various organic substances often produced by modifying the process of manufacture. Thus both the flavor and color of beer depend largely on the temperature and duration of heating of the malt before using it; the flavor of Scotch whisky is derived mainly from the peat used in drying the malt, etc. The quantity of alcohol contained in various beverages is very different: gin, rum, and the strong liquors contain from 40 to 50 per cent. of alcohol; port contains from 15 to 25 per cent.; sherry or madeira, from 15 to 20 per cent.; champagne and burgundy, from 10 to 13 per cent.; hock, from 10 to 12 per cent.; claret, from 8 to 12 per cent.; cider and strong ale, 5 to 9 per cent.; beer or porter, from 2 to 5 per cent.; koumiss, from 1 to 3 per cent. The *United States Pharmacopœia* fixes the specific gravity of rectified spirit at 0.820, which corresponds to 91 per cent. of absolute alcohol. The amount of alcohol in spirituous liquids is estimated by observing their specific gravity; but as they usually contain other substances besides water, they must be distilled before a determination can be made. Alcohol in its various forms, especially if taken habitually, is highly injurious to health. While it promotes very powerfully the secretion of the gastric juice, it sets up inflammation of the gastric walls and gradually produces chronic dyspepsia. (See ALCOHOL, PHYSIOLOGICAL AND POISONOUS ACTION OF.) The effects of chronic alcohol poisoning are described in the article ALCOHOLISM (q.v.).

Alcohol cannot be entirely freed from water by distillation. Anhydrous, or absolute alcohol, may be prepared by boiling strong commercial alcohol with unslaked lime until a small sample is turned yellow by barium oxide; to remove the last traces of water the alcohol thus obtained may be further treated with anhydrous copper sulphate and finally distilled over a small quantity of metallic sodium. The presence of traces of water may be readily detected by the use of dehydrated copper sulphate, which remains white only in perfectly anhydrous alcohol. Absolute alcohol acts as a deadly poison. It is a colorless liquid of specific gravity 0.8062 at 0°; it boils at 78° and solidifies at about 130° below zero C. It is extremely hygroscopic and mixes in all proportions with water, ether, chloroform, carbon disulphide, and many other liquids. It is also an excellent solvent for many substances, such as fats, oils, gums, resins, and a number of inorganic compounds, and is thus largely employed in the preparation of tinctures, varnishes, dyes, perfumes, etc. The presence of alcohol in aqueous solutions is best detected by the so-called iodoform reaction: small quantities of iodine and of potash almost immediately produce in the presence of alcohol a precipitate of iodoform, which may be readily recognized by its odor. In this manner it has been demonstrated that minute quantities of alcohol are present in the soil, in water, and in the atmosphere. Small quantities of alcohol have likewise been found in the urine in diabetes. When acted on by an excess of dry chlorine gas, alcohol is transformed into chloral, from which, by the action of alkali, very pure chloroform may be obtained; chloroform may also be prepared from alcohol directly by the action of bleaching powder (chloride of lime). When warmed with concentrated sulphuric acid, alcohol yields ordinary ether. Alcohol is thus extensively employed in the manufacture of chloral, chloroform, and ether.

Aqueous alcohol was separated by distillation from the mixture obtained through fermentation in the Middle Ages. Lowitz was the first to prepare anhydrous alcohol in 1796. The composition of alcohol was first determined by Saussure in 1808.

Consult: Stevenson, *A Treatise on Alcohol, with Tables of Specific Gravities* (London, 1888); Maercker, *Handbuch der Spiritusfabrikation* (Berlin, 1889; French translation, two volumes, Lille, 1889); and Roux's series of seven books on the manufacture of alcoholic beverages, published under the general title *La fabrication de l'alcool* (Paris, 1885-92). See ACETYLENE.

ALCOHOL, PHYSIOLOGICAL AND POISONOUS ACTION OF. Alcohol in a concentrated form exerts a local irritant action on the membranes and tissues of the animal body, mainly through its abstracting water from the tissues. According to its greater or less dilution, the quantity in which it is administered, the emptiness or fullness of the stomach, and the nature of the animal on which the experiment is made, alcohol may either act as a gentle stimulus, which assists the digestive process, or it may excite such a degree of irritation as may lead to the disorganization of the mucous membrane. It is well known that dilute alcohol in contact with animal matter, at a temperature of from 60° to 90°, undergoes acetic fermentation, and it was maintained by Leuret and Lassaigne that a similar change took place in the stomach. It appears, however, that only a small part of the alcohol undergoes this change; and it is the small part thus changed which produces, with other fermentations of the fats and proteids, the penetrating and disagreeable character of the eructations and vomited matters of drunkards. Alcohol is, however, for the most part, rapidly absorbed in an unchanged state either in the form of liquid or vapor, and this absorption may take place through the cellular (or connective) tissue, the serous cavities, the lungs, or the digestive canal. This is shown by the experiments of Orfila, who fatally intoxicated dogs by injecting alcohol into the subcutaneous cellular tissue, or by making them breathe an atmosphere charged with alcoholic vapor; and by Rayer, who injected about half an ounce of proof-spirit into the peritoneum of rabbits, which almost immediately became comatose and died in a few hours. It is, however, only with absorption from the intestinal canal that we have to deal in relation to man. Almost the whole of this absorption is effected in the stomach, and it is only when alcohol is taken in great excess, or is mixed with a good deal of sugar, that any absorption beyond the stomach occurs. The rapidity of the absorption varies according to circumstances. The absorption is most rapid when the stomach is empty and the drinker is fatigued, while the action is delayed by a full stomach, and especially by the presence of acids, tannin, or the mucilaginous and saccharine ingredients of many wines. The chief action of alcohol is that on the central nervous system; either, as some hold, stimulating the cells of the cerebrum to greater activity, or, as others claim, exerting a paralyzing action from the very start and reducing control or inhibition. The self-restraint that regulates thought and speech being removed, the person seems more brilliant and capable. Recent studies, however, show that under the influence of even small amounts of alcohol the capacity for work is less and its quality deteriorates. Kraepelin, in studying some of the simpler problems of addition, multiplication, spelling, and pronunciation, found that the acuteness of perception was diminished and the intellectual powers weakened. Purely muscular power was increased with small doses and diminished under larger doses. On the spinal cord the action of alcohol is depressing, apparently from the very beginning. Lack of coördination, leading to a staggering gait and blurring speech, are familiar. Reflex irritability is also diminished, and the spinal sensory areas ultimately paralyzed. On respiration, alcohol acts appreciably only in large doses. The function is only slightly, if at all, stimulated. Nearing death, the respiratory centre in the medulla is paralyzed. Alcohol increases the force of the heart-beat, and is a useful heart stimulant. It is a vexed question whether alcohol is a food. In one sense of the word it is. It is capable of being oxidized in the body, and is thus a source of heat and energy. Atwater has shown that at least two ounces of alcohol can be completely oxidized by the body in twenty-four hours and none of it be found in any of the excretory products. Alcohol, therefore, in a sense saves the use of fats and carbohydrates, and thus the body stores up fat for future use. This is one explanation why so many users of alcohol grow fat. The drug furnishes heat, and the fat is, therefore, not used up but is stored in the body. The doctrine that whisky warms the body is false. It really lowers the temperature, and the evaporation of the increased amount of perspiration further diminishes the temperature. It imparts a sense of warmth to the skin because it dilates the blood vessels of the surface. Persons who are to be exposed to cold temperatures would derive more valuable effects from hot drinks, such as coffee, or cocoa, or milk, from the eating of fatty food, starches, and sugars than they would from consuming any alcoholic drinks. After exposure is ended it may be useful to hasten reaction.

As alcohol is taken up directly into the circulation wherever it comes in contact with any tissue, an irritation is produced which, if continued for any length of time, results in the formation of new connective tissue cells. These, when formed in abnormal numbers in various organs, lead to disturbances in the function of these organs and ultimately to disease. The blood vessels become harder and lose their elasticity. (See Arterio-Sclerosis.) The liver may become larger and harder. The new connective tissue in the kidneys may cause Bright's disease (q.v.). Acting on the brain, alcohol may cause alcoholic dementia; or acting on the superficial nerves, may cause neuritis. These are the results of chronic alcoholic poisoning, which probably exceeds all other agents as a cause of poverty, disease, crime, and death. Consult: Brunton, "The Physiological Action of Alcohol," in *Practitioner* (Volume XVI., London, 1876); Anstie's *Stimulants and Narcotics* (London, 1864); Atwater, *United States Department of Agriculture, Bulletins 63 and 69* (Washington, 1897-98); Rosenfeld's *Der Einfluss des Alkohols auf den Organismus* (Wiesbaden, 1901). See Alcoholism; Antidotes; Bright's Disease; and Intoxication.

AL'COHOLISM. The term employed to denote the symptoms of disease produced by alcoholic poisoning. In acute alcoholism, which is generally caused by the rapid absorption of a large quantity of alcoholic drinks, the first symptoms are animation of manner, exaltation of spirits, and relaxation of judgment. The emotions are altered and often perverted; muscular movements become irregular or ataxic; the mechanism of speech suffers. The further development of the symptoms presents a variety of effects. In the ordinary course of the action of the drug, dizziness, disturbance of sight and hearing, and other troubles due to disorder of the central nervous system, ensue, leading to heavy sleep or profound coma, from which it is sometimes impossible to rouse the individual, who lies completely paralyzed, breathing stertorously. Sometimes the alcohol affects so strongly the centres of respiration and circulation that death is caused by paralysis of one or other, or both. This condition of coma requires to be carefully distinguished from opium poisoning. In the former, the face is usually flushed and the pupils dilated, while in the latter the face is pale and the pupils contracted. The odor of the breath is no criterion, inasmuch as sympathizing bystanders are apt to administer spirits in every case of depression, often with hurtful effects. Fracture of the skull, delirium of meningitis, and coma after epilepsy or after cerebral hemorrhage are often undiscovered by the inefficient ambulance surgeon, who is led to diagnose a condition from an alcoholic breath. A second class of alcoholics act in an entirely different manner. Instead of sinking into stupor or coma, the individual becomes more and more excited, bursts into wild mirth or passionate anger, struggles violently with those who attempt to soothe him, and may grievously harm himself or others. This is the condition known as alcoholic mania—the physical explanation of many fearful crimes. It is more apt to follow a somewhat protracted debauch. After a longer or shorter period of fierce excitement, it is in most cases succeeded by great depression, and sometimes during this condition there may be sudden death from failure of the respiration or circulation. In some patients the stage of excitement culminates in a convulsive seizure. The convulsions are repeated at intervals, are very complicated in character, and produce remarkable contortions of the body. These usually grow less violent, and, passing off, end in deep sleep; but here also death may occur from the action of the poison. Such cases of "alcoholic epilepsy" are comparatively rare, and occur principally in acute exacerbations of chronic alcoholism. Acute alcoholism is more apt to occur in those who are of unsound mind and weak nervous system, and this applies especially to the two last-described forms of the affection. In the treatment of acute alcoholism, it is always wise to wash out the stomach, in case alcohol is present, or to accomplish much the same object by free vomiting and purgation. In the profound coma, the administration of stimulants, such as ammonia and strychnine, may be called for, and sometimes artificial respiration may be the only means of saving life. In the maniacal and convulsive forms of the affection, sedatives must be used. After the immediate symptoms have passed away in all forms, the individual must be carefully fed with nutrient enemata, on account of the disturbance of the digestive system, along with remedies which will subdue the digestive irritation and overcome the depression of the nervous system.

Chronic alcoholism is caused by the prolonged use of overdoses of various alcoholic drinks. Changes (see Alcohol, Physiological and Poisonous Action of) are caused in every tissue of the body, but the nervous, respiratory, and circulatory systems are more especially affected, together with the liver and kidneys. There is always more or less catarrh of the digestive organs, shown by dyspepsia, heart-burn, vomiting — especially in the morning — and usually diarrhea. The liver becomes enlarged from congestion, and may afterward shrink, pressing on the veins and bringing back blood to the heart from the abdominal viscera, leading to congestion of the bowels, hemorrhoids, and hemorrhages. From changes in the organs of circulation there is a tendency to palpitation, fainting, and breathlessness on exertion. These alterations are degenerations of the heart, which may be soft or even fatty; fibrous changes in the walls of the arteries; and dilatation of the capillaries from paralysis of the vaso-motor nerves. This last condition gives the florid complexion and mottled appearance to chronic drinkers. There is, besides, usually some congestion of the kidneys; but it is erroneous to attribute Bright's disease mainly to alcohol. The lungs are subject to chronic congestion and catarrh of the bronchial tubes and lung tissues. The muscular system suffers, the muscles becoming flabby and fatty. There is a great tendency to deposition of fat, and skin diseases are frequently induced by the vaso-motor changes.

Two characteristic results of the action of the drug on the central nervous structures are delirium tremens and alcoholic insanity. (See INSANITY.) In treating chronic alcoholism the great point is to prevent the employment of alcohol in any form, and to invigorate the bodily and mental functions. See DELIRIUM.

Alcoholism is also the term used by many sociological writers, especially French and German authors, in discussing the social evils arising from an abuse of intoxicants. Particularly important are the investigations of the relation of alcoholism to pauperism and crime, and the legal aspects of the subject as exhibited in the way various communities deal with drunkenness (q.v.).

BIBLIOGRAPHY. The Committee of Fifty has made the best study of the subject in its volume on *Economic Aspects of the Liquor Problem* (Boston, 1899). And consult also: "The Relations of the Liquor Traffic to Pauperism, Crime, and Insanity," *Twenty-sixth Annual Report of the Massachusetts Bureau of Labor Statistics* (Boston, 1895); and "Economic Aspects of the Liquor Problem," *Twelfth Annual Report of the United States Department of Labor* (Washington, 1898). See TEMPERANCE.

AL'COHOLOM'ETRY (*alcohol* + Gk. *μέτρον, metron*, measure). A name applied to any process of estimating the percentage of absolute alcohol in a sample of spirits. Certain chemical methods have been tried for the purpose, but the one usually employed consists in determining the specific gravity of the spirit. As liquors, however, generally contain other substances besides water, they must be carefully distilled before a determination can be made. Every mixture of alcohol and water has a specific gravity of its own, which depends: (1) on the relative composition of the mixture, and (2) on the temperature; once the specific gravities of various mixtures have been determined, the composition of a sample can be ascertained by determining its specific gravity and observing the temperature. The following table shows the specific gravities of mixtures of alcohol and water, containing 5, 10, 15, 20, etc., per cent. by weight of alcohol, at the temperatures 0°, 10°, 20°, and 30° C.:

Percentage by Weight of Alcohol.	0°	10°	20°	30°
5	0.99135	0.99113	0.98945	0.98680
10	0 98493	0.98409	0.98195	0.97892
15	0.97995	0.97816	0.97527	0.97142
20	0.97566	0.97263	0.96877	0.96413
25	0.97115	0.96672	0.96185	0.95628
30	0.96540	0.95998	0.05403	0.94751
35	0.95784	0.95174	0.94514	0.93813
40	0.94939	0.94255	0 93511	0.92787
45	0.93977	0.93254	0.92493	0.91710
50	0.92940	0.92182	0.91400	0.90577
55	0.91848	0.91074	0.90275	0.89456
60	0.90742	0.89944	0.89129	0.88304
65	0.89595	0.88790	0.87961	0.87125
70	0.88420	0.87613	0.86781	0.85925
75	0.87245	0.86427	0.85580	0.84719
80	0.86035	0.85215	0.84366	0.83483
85	0.84789	0.83967	0.83115	0.82232
90	0.83482	0.82665	0.81801	0.80918
95	0.82119	0.82291	0.80433	0.79553
100	0.80625	0.79788	0.78945	0.78096

See also article, HYDROMETER.

ALCOHOLS. A name applied in organic chemistry to one of the largest and most important classes of carbon compounds. The alcohols possess in common certain chemical properties, though they are otherwise very different from one another. They all contain one or more hydroxyl groups (OH) linked directly to some fatty hydrocarbon group (such as methyl, CH_3, ethyl, C_2H_5, etc.), and are subdivided both with reference to the number of their hydroxyl groups, and with reference to the nature of their hydrocarbon groups. When the alcohols are acted on by the chlorides or bromides of phosphorus, chlorine or bromine takes the place of their hydroxyl groups, and as a result, halogen derivatives of the corresponding hydrocarbons are produced. Thus, by the action of phosphorus pentachloride, ethyl alcohol may be transformed into ethyl chloride (mono-chloro-ethane), according to the following chemical equation:

$$\underset{\text{Ethyl alcohol}}{C_2H_5OH} + PCl_5 = \underset{\text{Ethyl chloride}}{C_2H_5Cl} + POCl_3 + HCl$$

With reference to the number of their hydroxyl groups, the alcohols are divided into *mono-hydric, di-hydric, tri-hydric*, etc. According to the nature of the radicle to which these groups are attached, alcohols may be *saturated* or *unsaturated, fatty* or *aromatic*. With reference to their chemical constitution and behavior toward oxidizing agents, alcohols are further divided into *primary, secondary*, and *tertiary*. The primary alcohols are characterized by the mono-valent group CH_2OH; the secondary, by the di-valent group CHOH; the tertiary by the tri-valent group COH. The differences in their reactions are described below.

The alcohols are in certain respects analogous to the metallic hydroxides of inorganic chemistry. As, for instance, potassium hydroxide (KOH) may be considered as derived from water by replacing half of its hydrogen by potassium, so may methyl alcohol be considered as derived from water by substituting the hydrocarbon radicle called methyl (CH_3) for half of its hydrogen, the corresponding formulas being:

$$\underset{\text{Water}}{H - OH} \qquad \underset{\text{Potassium hydroxide}}{K - OH} \qquad \underset{\text{Methyl alcohol}}{CH_3 - OH}$$

Again, as metallic hydroxides combine with acids to form salts, so alcohols combine with acids to form *esters* (ethereal salts), which are perfectly analogous to the salts of inorganic chemistry. The following two equations represent, respectively, the formation of a salt and of an ester:

$$\underset{\text{Potassium hydroxide}}{KOH} + \underset{\text{Hydrochloric acid}}{HCl} = \underset{\text{Potassium chloride}}{KCl} + \underset{\text{Water}}{H_2O}$$

$$\underset{\text{Ethyl alcohol}}{C_2H_5OH} + \underset{\text{Acetic acid}}{HC_2H_3O_2} = \underset{\text{Ethyl-acetic ester}}{C_2H_5C_2H_3O_2} + \underset{\text{Water}}{H_2O}$$

The hydrogen of the hydroxyl group of an alcohol can be replaced either by metals or by hydrocarbon radicles. In the former case, a metallic *alcoholate* is obtained; in the latter, an *ether*. Thus, by the action of metallic sodium on ordinary (ethyl) alcohol, sodium alcoholate is obtained, according to the following chemical equation:

$$\underset{\text{Ethyl alcohol}}{C_2H_5OH} + Na = \underset{\text{Sodium alcoholate}}{C_2H_5ONa} + H$$

On the other hand, by dehydrating ethyl alcohol, ordinary ether is obtained, as follows:

$$\underset{\text{2 molecules of ethyl alcohol}}{C_2H_5OH + C_2H_5OH} - H_2O = \underset{\text{Ethyl ether}}{C_2H_5OC_2H_5}$$

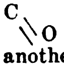
In this transformation (usually effected by the dehydrating action of sulphuric acid), the ethyl group of one molecule of alcohol evidently takes the place of the hydroxyl hydrogen of another molecule. An analogous reaction takes place when a mixture of two different alcohols is subjected to the dehydrating action of sulphuric acid:

$$\underset{\text{Ethyl alcohol}}{C_2H_5OH} + \underset{\text{Methyl alcohol}}{CH_3OH} - H_2O = \underset{\text{Methyl-ethyl ether}}{C_2H_5OCH_3}$$

The chemical similarity between the alcoholates and the ethers is further shown by the fact that the latter may be readily obtained from the former. Thus, methyl ether may be obtained by the action of methyl iodide on sodium-methylate (an alcoholate), according to the following chemical equation:

$$\underset{\text{Sodium methylate}}{CH_3ONa} + \underset{\text{Methyl iodide}}{CH_3I} = \underset{\text{Methyl ether}}{CH_3OCH_3} + \underset{\text{Sodium iodide}}{NaI}$$

The chemical transformations characterizing the three sub-classes of the alcohols, viz., the primary, secondary, and tertiary alcohols, may now be briefly considered.

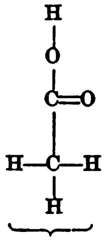
1. It was mentioned above that primary alcohols contain the group CH_2OH. When they are oxidized, this group is changed into the group  which is characteristic of the aldehydes—another important class of organic compounds. Thus, when ethyl alcohol is oxidized with chromic acid, ordinary aldehyde is obtained, according to the following chemical equation:

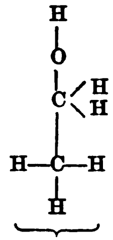
$$\underset{\text{Ethyl alcohol}}{CH_3CH_2OH} + O = \underset{\text{Aldehyde}}{CH_3CHO} + H_2O$$

By further combination with oxygen, aldehydes readily yield acids, the group CHO being exchanged for the acid group $\overset{/\!/O}{C}\text{—}OH$. Thus, when ordinary aldehyde is oxidized, acetic acid is produced, as follows:

$$\underset{\text{Aldehyde}}{CH_3CHO} + O = \underset{\text{Acetic acid}}{CH_3COOH}$$

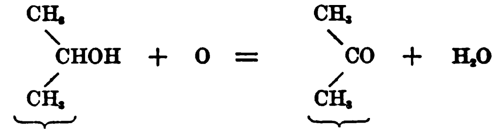
If the structural formulæ of acetic acid and ethyl alcohol are compared,


Acetic acid


Ethyl alcohol,

it may be seen that the gradual oxidation resulted in the substitution of one atom of oxygen for the two atoms of hydrogen linked to the same carbon atom to which the OH group of the alcohol is linked. If in the place of these hydrogens, the alcohol molecule contained atomic groups like methyl, for instance, which could not be replaced by oxygen, the acid could evidently not be made by oxidizing the alcohol. In other words, unless an alcohol contains two hydrogens linked to the hydroxyl group OH through a carbon atom, it could not be transformed, by simple oxidation, into an acid containing the same number of carbon atoms; only primary alcohols, characterized by the group CH_2OH, are capable of this transformation.

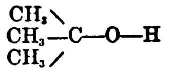
2. When secondary alcohols are oxidized, their characteristic group CHOH is converted into the group CO, and as a result *ketones* are produced. Thus, when iso-propyl alcohol is acted on by oxidizing agents, ordinary acetone (di-methyl-ketone) is produced, according to the following chemical equation:



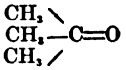
$$\underbrace{\begin{matrix}CH_3\\ \diagdown\\ CHOH\\ \diagup\\ CH_3\end{matrix}}_{\text{Iso-propyl alcohol}} + O = \underbrace{\begin{matrix}CH_3\\ \diagdown\\ CO\\ \diagup\\ CH_3\end{matrix}}_{\text{Acetone}} + H_2O$$

It is seen that the molecule of acetone contains the same number of carbon atoms as the molecule of iso-propyl alcohol.

3. Tertiary alcohols cannot be transformed by simple oxidation into a compound whose molecule contains the same number of carbon atoms. In the language of the structural theory, the only atomic group into which the characteristic COH group of the tertiary alcohols could be converted by simple loss of hydrogen through oxidation, is the group CO. Now, the COH group is trivalent, and is, in tertiary alcohols, combined with three radicles; thus, the simplest tertiary alcohol, called tertiary butyl alcohol, is represented by the graphic formula:


Tertiary butyl alcohol

If its COH group were converted into CO, a compound would be obtained in which carbon would exist in the penta-valent form, as shown by the formula:



$$\begin{array}{l}CH_3\diagdown\\CH_3—C=O\\CH_3\diagup\end{array}$$

Neither this, nor any other compound containing penta-valent carbon, is known. In reality, when a tertiary alcohol is oxidized, it breaks up into various compounds, each containing less carbon atoms than the alcohol.

The three sub-classes of alcohols can thus be readily distinguished from one another by their behavior toward oxidizing agents.

Primary alcohols may be transformed into corresponding secondary or tertiary alcohols with the aid of sulphuric acid. As an example may be mentioned the conversion of normal propyl alcohol (primary) into iso-propyl alcohol (secondary). (1) By the dehydrating action of sulphuric acid on normal propyl alcohol, the hydrocarbon propylene is obtained, according to the following equation:

$$\underset{\text{Normal propyl alcohol}}{CH_3CH_2CH_2OH} - H_2O = \underset{\text{Propylene}}{CH_3CH:CH_2}$$

(2) When propylene is dissolved in fuming sulphuric acid and the compound thus obtained is boiled with water, iso-propyl alcohol is obtained:

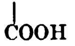
$$\underset{\text{Propylene}}{CH_3CH:CH_2} + \underset{\text{Water}}{H_2O} = \underset{\text{Iso-propyl alcohol}}{CH_3CH(OH)CH_3}$$

In this manner a hydroxyl group can be made to change its position in the molecule by simple laboratory methods.

The di-hydric alcohols, as the name indicates, contain two hydroxyl groups. Glycols is the name usually applied by chemists to the di-hydric alcohols. The simplest glycol, derived from methane (CH_4)—the simplest hydrocarbon—should be represented by the formula $CH_2(OH)_2$. But though certain compounds of this glycol have been obtained, the glycol itself could not be prepared in the free state. Experience shows, in general, that the formation of a compound in which two hydroxyl groups might be attached to one carbon atom is almost invariably accompanied by a loss of the elements of water. The imaginary compound $CH_2(OH)_2$ is thus split up, according to the following equation:

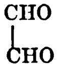
$$CH_2(OH)_2 = CH_2O + H_2O$$

The compound CH_2O (formaldehyde) is therefore obtained in reactions which might be expected to result in the formation of the glycol $CH_2(OH)_2$. The simplest glycol actually prepared is a derivative of ethane (C_2H_6), one hydroxyl group being attached to each of the two carbon atoms of ethane, and its formula therefore being $\begin{array}{c}CH_2OH\\|\\CH_2OH\end{array}$. This glycol evidently contains two primary alcohol groups (CH_2OH), by the oxidation of one or both of which a series of interesting compounds is obtained, including:



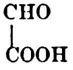
$$\begin{array}{l}CH_2OH\\|\\COOH\end{array}$$

Glycocollic acid



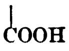
$$\begin{array}{l}CHO\\|\\CHO\end{array}$$

Glyoxal



$$\begin{array}{l}CHO\\|\\COOH\end{array}$$

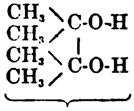
Glyoxylic acid



$$\begin{array}{l}COOH\\|\\COOH\end{array}$$

Oxalic acid

Glycols containing two tertiary-alcohol groups (COH) are usually called *pinacones*, the simplest pinacone known being represented by the following graphic formula:



$$\begin{array}{l}CH_3\diagdown\\CH_3\diagup C\text{-}O\text{-}H\\ \qquad\;|\\CH_3\diagdown\\CH_3\diagup C\text{-}O\text{-}H\end{array}$$

Ordinary pinacone

The simplest and best known tri-hydric alcohol is the well-known glycerin (q.v.), which may be considered as derived from propane ($CH_3CH_2CH_3$) by the substitution of hydroxyl groups for three hydrogens attached to three different carbon atoms; the constitutional formula of glycerin is $CH_2(OH).CH(OH).CH_2(OH)$.

Among the few other poly-hydric alcohols known may be mentioned the hexa-hydric alcohol *mannitol*, which is found in *manna* (q.v.). The poly-hydric alcohols generally possess a sweet taste and are insoluble in ether. They mostly occur ready formed in nature.

The mono-hydric alcohols are rarely found in nature in the free state; in the form of esters, however, i.e., in combination with acids, they occur largely in the vegetable kingdom. The formation of alcohols from the sugars through fermentation is described elsewhere. (See ALCOHOL and FERMENTATION.) It remains to mention here a few of the general chemical methods by which alcohols are made artificially.

1. Many alcohols are prepared from the corresponding hydrocarbons by substituting halogens for part of their hydrogen, and treating the halogen derivatives thus obtained with dilute aqueous alkalis or with moist silver oxide. The following equations represent examples of the formation of alcohols from halogen-substitutive-products of hydrocarbons:

$$\underset{\substack{\text{Mono-bromo-}\\\text{methane}}}{CH_3Br} + \underset{\substack{\text{Potassium}\\\text{hydroxide}}}{KOH} = \underset{\substack{\text{Methyl}\\\text{alcohol}}}{CH_3OH} + \underset{\substack{\text{Potassium}\\\text{bromide}}}{KBr}$$

$$\underset{\substack{\text{Mono-iodo}\\\text{propane}}}{C_3H_7I} + \underset{\substack{\text{Silver}\\\text{hydroxide}}}{AgOH} = \underset{\substack{\text{Propyl}\\\text{alcohol}}}{C_3H_7OH} + \underset{\substack{\text{Silver}\\\text{iodide}}}{AgI}$$

2. Since aldehydes are produced by the oxidation of primary alcohols, the latter may be obtained, conversely, by reducing aldehydes. Thus, ethyl alcohol may be obtained by the action of nascent hydrogen upon ordinary aldehyde, according to the following equation:

$$\underset{\text{Aldehyde}}{CH_3CHO} + 2H = \underset{\text{Ordinary alcohol}}{CH_3CH_2OH}$$

3. Since ketones are produced by the oxidation of secondary alcohols, the latter may, conversely, be prepared from ketones by reduction. Thus, secondary propyl alcohol may be obtained by the action of nascent hydrogen on acetone (di-methyl-ketone), according to the following equation:

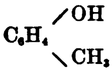
$$\underset{\text{Acetone}}{CH_3.CO.CH_3} + 2H = \underset{\text{Iso-propyl alcohol}}{CH_3CH(OH)CH_3}$$

4. Tertiary alcohols may be prepared from chlorides of acid radicles with the aid of compounds of zinc and hydrocarbon radicles. Thus, tertiary butyl alcohol is obtained according to the following equation:

$$\underset{\text{Acetyl chloride}}{CH_3COCl} + \underset{\text{Zinc-methyl}}{2Zn(CH_3)_2} + 2H_2O =$$

$$\underset{\text{Tertiary butyl alcohol}}{(CH_3)_3COH} + \underset{\text{Zinc-chloro-methyl}}{CH_3ZnCl} + \underset{\text{Zinc hydroxide}}{Zn(OH)_2} + \underset{\text{Methane}}{CH_4}$$

The aromatic alcohols may be prepared by methods analogous to those just described. Aromatic alcohols must be distinguished from the phenols—a class of hydroxyl derivatives of the aromatic hydrocarbons—which are in many respects quite different from the true alcohols; thus, phenates of the alkali metals are obtained by the action of alkaline hydroxides on phenols, while alcoholates can only be produced from alcohols by the action of the alkali metals themselves, their hydroxides having no action on alcohols. Theoretically the difference between aromatic alcohols and phenols consists in this, that in the latter the hydroxyl groups are attached immediately to the so-called benzene ring, while in the former they are attached to a side-chain. The difference is clearly shown by the following constitutional formulæ, representing, respectively, a well-known phenol and the simplest aromatic alcohol known:



$$C_6H_4\begin{cases}OH\\CH_3\end{cases}$$

Cresol (a phenol)

$C_6H_5—CH_2—OH$

Benzyl alcohol (an alcohol)

The more important alcohols are described under special heads.

ALCOLEA, ăl′kô-lā′ȧ, Bridge of. A bridge across the river Guadalquivir, eight miles northeast of Cordova, Spain, the scene of a battle September 28, 1868, between the revolutionary troops of Serrano and those of Queen Isabella. The latter were beaten and the Queen, dethroned, fled to France.

ALCORAN, ăl′kô-răn *or* ăl′kô-rän′. See Koran.

ALCORN, ăl′kẽrn, James Lusk (1816-94). An American statesman, born in Galconda, Illinois. He was educated at Cumberland University, Kentucky, and became a lawyer in that State and sat in its Legislature. He went to Mississippi in 1844, and served in the State Legislature from 1846 to 1865, when he was elected United States Senator, but was not then permitted to take his seat. He was elected governor on the Republican ticket in 1869, but resigned two years later to enter the United States Senate, where he continued until 1877. In 1873 he was defeated for governor on an independent ticket. He was the founder of the levee system of the Mississippi.

ALCOTT, ạl′kŭt, Amos Bronson (1799-1888). An American educational reformer, conversationalist, and transcendental philosopher. He was born at Wolcott, Conn., November 29, 1799, and died in Boston, March 4, 1888. He was the son of a farmer, and his first experience of life was gained as a peddler in the South. In 1828 he became an educational reformer and established in Boston a school, in which he attracted much attention by the novelty of his methods. Of this there is an account by Elizabeth Peabody (*A Record of Mr. Alcott's School*, 1834; third edition, 1874). His method was largely conversational, and a transcript of his talks appeared in 1836 as *Conversations with Children on the Gospels*. Ways that would now seem more commendable than noteworthy then met with bitter denunciation, so that Alcott abandoned his school, moved to Concord, and sought to disseminate his views on theology, education, society, civics, and vegetarianism through lectures, winning attention by his originality and graceful speech. In 1842 he visited England and returned with two friends, one of whom bought an estate near Harvard, Mass., where they endeavored to found a community, "Fruitlands," which speedily failed. Alcott then went to Boston, and thence to Concord, leading the life of a peripatetic philosopher, and giving "conversations," which found increasing favor, especially in the West. In later years his manner became more formal and his always nebulous teaching apparently more orthodox. Besides frequent contributions of "Orphic Sayings" to the Transcendental organ, *The Dial*, he published fragments from his voluminous diary, *Tablets* (1868); *Concord Days* (1872); *Table Talk* (1877); *Sonnets and Canzonets* (1877), and also *New Connecticut* (1881), and an *Essay on Ralph Waldo Emerson, His Character and Genius* (1882). For his biography, consult Sanborn and Harris, *Life* (Boston, 1893); also Lowell's contemporary criticism, in *A Fable for Critics* (New York, 1848), and *A Study from Two Heads*, in the *Poems*.

ALCOTT, Louisa May (1832-88). An American novelist and juvenile writer. She was born at Germantown, Pa., November 29, 1832, and died at Boston, March 6, 1888. She began her active life as a teacher, writing stories of harmless sensation for weekly journals, and publishing the insignificant *Flower Fables* (1855). During the Civil War she volunteered as an army nurse, and wrote for a newspaper the letters afterward collected as *Hospital Sketches* (1863). She first attracted notice by *Little Women* (1868; second part, 1869), the best and most popular of her writings. Among the more noteworthy of numerous other contributions to the literature of adolescence are: *An Old-Fashioned Girl* (1869), *Little Men* (1871). *Jo's Boys* (1886). Her novels, *Moods* (1863) and *Work* (1873), attracted little attention. In later years she suffered much from ill-health: but her writing was to the last singularly buoyant and hopeful, full of faith in human nature, democracy, and freedom. She was typical in her social ethics of the literary generation in which her father, Amos Bronson Alcott (q.v.), had been a prominent figure. There is a *Life*, by Cheney (Boston, 1889).

ALCOTT, May (1840-79). An American artist, daughter of Amos Bronson Alcott, and wife of Ernest Nieriken. She was born at Concord, Mass., and after attending the Boston School of Design, studied under Krug, Dr. Rimmer, Hunt, Vautier, Johnston, and Müller. She showed considerable skill in still-life studies, but attained her greatest success by her oil and water-color copies of the paintings of Turner, which were highly praised by Mr. Ruskin, and were given to the pupils of the South Kensington schools, London, to work from. Mrs. Nieriken was the author of *Concord Sketches* (Boston, 1869).

ALCOY, ȧl-kō′ā. A town of Spain, in the province of Alicante. It is situated on the river Alcoy, 24 miles north-northwest of the city of

Alicante (Map: Spain, E 3), and is one of the most busy and prosperous of Spanish towns. It is picturesquely placed on the slope of the Sierra Mariola, whose streams afford an abundance of water-power. The public buildings include a consistory, town hall, poorhouse, and public granary. The city is the great centre of paper manufacture, and the mills are of considerable antiquity. Their production is large. The cigarette paper of Alcoy is known to every Spanish smoker, but sugar-plums, *peladillas de Alcoy*, woolen cloth, linen and cotton goods, as well as hardware, also form important branches of manufacture. Pop., 1900. 31,578. The prosperity of the place was interrupted for a time in 1873 by an insurrection of the Spanish Internationals.

ALCUDIA, ȧl-kōō'dē-ȧ, MANUEL DE GODOY. See GODOY, MANUEL, DUKE OF ALCUDIA.

ALCUIN, ăl'kwĭn, or FLACCUS ALBINUS (c. 735-804). The most distinguished scholar of the eighth century, the confidant and adviser of Charlemagne. He was born at York, was educated under the care of Archbishop Ecbert, and his relative, Ælbert, and succeeded the latter as master of the school of York. Charlemagne became acquainted with him at Parma, as he was returning from Rome, whither he had gone to bring home the *pallium* for a friend. He invited Alcuin to his court, and had his assistance in his endeavors to civilize his subjects. As a result of this association, Alcuin became the preceptor of the Emperor, whom he instructed in various subjects, especially rhetoric and dialectics. To render his instruction more available, Charlemagne established at his court a school called Schola Palatina, the superintendence of which, as well as of several monasteries, was committed to Alcuin. In the learned society of the court, Alcuin went by the name of Flaccus Albinus. Many of the schools in France were either founded or improved by him. He retired to the abbey of St. Martin, in Tours, in 796, and taking as his model the school of York, taught at Tours. While there he wrote frequently to the Emperor. He died May 19, 804. He left, besides numerous theological writings, a number of works on philosophy, mathematics, rhetoric, and philology, as well as poems and a great number of letters. His letters, while they betray the uncultivated character of the age generally, show Alcuin to have been the most accomplished man of his time. He understood Latin, Greek, and Hebrew. Editions of his works appeared in 1617 (Paris), 1777 (Ratisbon), and in Migne's *Patrologia*. Consult: Monnier, *Alcuin et Charlemagne* (Paris, 1864); Mullinger, *Schools of Charles the Great* (London, 1877); West, *Alcuin and the Rise of Christian Schools* (New York, 1892); and Gaskoin, *Alcuin* (New York, 1904).

AL'CYONA'RIA (From Gk. *ἀλκυόν*[*ε*]*ιον*, *alkyon*[*e*]*ion*, bastard-sponge). A subclass of the Anthozoa, comprising a group of coral-polyps, characterized by the presence of eight tentacles around the mouth and the division of the gastrovascular cavity into eight chambers. Typical forms, like the precious red corals, fall into the subordinate group Alcyonacea; the sea-fans constitute the group Gorgonacea; and the sea-pens the group Pennatulacea. See CORAL.

ALCY'ONE, or **HALCYONE** (Gk. Ἀλκυόνη, *Alkyonē*). In later Greek legend, the daughter of Æolus and wife of Ceyx. Inconsolable on the death of her husband, she threw herself into the sea, whereupon she and her husband were changed into kingfishers as a reward of their mutual devotion. Alcyone is originally a sea divinity, and appears in the legends of Bœotia, Argos, and elsewhere. The myth has been perpetuated in zoölogy by the name of a genus (Alcyone) of kingfishers; and these birds are frequently called halcyons in poetic literature.

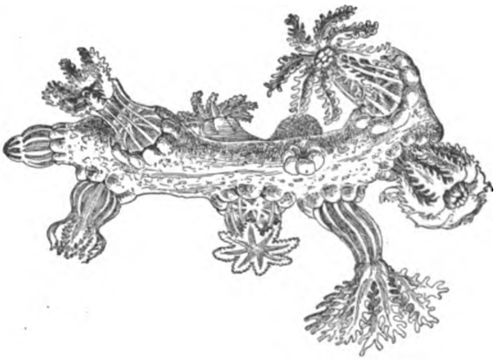
ALCYONE (Gk. Ἀλκυόνη, *Alkyonē*). The most brilliant of the "seven stars" or Pleiades. This is the star which was supposed by Mädler to be the central sun, in reference to which our sun with its planets and all other known systems are moving, perhaps revolving within some almost incomprehensible period of time. It has been shown, however, that any central sun hypothesis is, as yet, far too daring, considering the insufficient state of our knowledge of sidereal systems and their motions. See PLEIADES.

AL'DABEL'LA. (1) In Ariosto's *Orlando Furioso* (q.v.), the wife of Orlando, daughter of Monodantes and sister of Oliviero. In French and Spanish versions of the Orlando legends she appears as Alda and Auda. (2) In Dean Milman's tragedy of *Fazio* (q.v.), a fascinating but wicked woman, of whom Bianca, Fazio's wife, has cause for jealousy, and who is finally condemned to a nunnery.

ALDAN, ȧl-dän'. An affluent of the Lena, rising in the Siberian territory of Yakutsk, near the mountain ridge of Yablonov, in lat. 56° 31′ N., and long. 123° 51′ E. (Map: Asia, M 3). After flowing in a generally northerly direction for 1320 miles it empties into the Lena, 111 miles below Yakutsk. It is navigable for a distance of over 600 miles. It abounds in sturgeon and sterlet.

ALDAN, ȧl-dän'. A mountain range on the left shore of the river that gives it its name, between 55° and 61° N. lat. (Map: Asia, M 3). It is a branch of the Stanovoi, about 400 miles long, with an average altitude of 4000 feet.

ALDBOROUGH, ąld'bŭr'ō, *or, colloquially,* ą'bro (A. S. *ald*, old). An ancient village in the West Riding of Yorkshire, 16 miles west northwest of York (Map: England, E 2). It is chiefly remarkable for its ancient ruins. It was the Isurium of the Romans, and after York (Eboracum) the most considerable Roman camp north of the Humber. Remains of aqueducts, buildings, tessellated pavements, implements,



ALCYONARIA.

urns, and coins have been found in great number. Pop., 1901, 800.

ALDEB'ARAN (Ar. *al-dabarân*, the follower, i.e., of the Pleiades). The name of a star of the first magnitude, in the constellation Taurus. It is the largest and most brilliant of a cluster of five which the Greeks called the Hyades. From its position it is sometimes termed "the bull's eye."

ALDEGONDE, ȧl'de-gôɴd', PHILIP VAN MARNIX, SAINT. See MARNIX, PHILIP VAN.

ALDEGREVER, äl'de-grā'vẽr, HEINRICH (1502-c. 1562). A German painter and engraver. From his style, which closely resembles his master's, he has been called "the Albrecht Dürer of Westphalia." His engravings put him in the first rank of "little masters." They include portraits of Luther, Melanchthon, and John of Leyden. Of his paintings, the most noteworthy are the "Portrait of a Young Man" (1544), at Vienna, and a "Resurrection," at Prague.

AL'DEHYDE, ACETIC, CH_3CHO, often called ORDINARY ALDEHYDE, or simply ALDEHYDE. A colorless liquid having a peculiar pungent and suffocating odor. It is very volatile and inflammable; it boils at 20.8° C., and has at 0° C. a specific gravity 0.801. It occurs in crude alcohol and wood spirit, and is readily made from ordinary alcohol by oxidation with chromic acid. If a mixture of three parts of alcohol and four parts concentrated sulphuric acid is run into a vessel kept in a warm water-bath and containing three parts of coarsely powdered potassium bichromate and twelve parts water, a reaction takes place, during which a considerable amount of aldehyde is formed. The latter is isolated in a somewhat impure state by distillation, and may be purified by the use of ammonia. Aldehyde combines with ammonia to form a solid crystalline substance called aldehyde-ammonia, and having the formula $CH_3CH(NH_2)OH$; alcohol and acetal, which are generally contained as impurities in crude aldehyde, form no solid compound with ammonia. Therefore, to separate aldehyde from these substances, crystalline aldehyde-ammonia is produced by the direct action of ammonia, washed with ether, and broken up by distillation with dilute sulphuric acid. The aldehyde thus obtained is further dehydrated by distillation with dry calcium chloride. Aldehyde is used in the manufacture of certain valuable dyes. If added to an ammoniacal solution of silver nitrate, it produces a precipitate of metallic silver, which may form a mirror if evenly deposited on a glass surface. By the action of reducing agents, aldehyde is converted into alcohol; oxidizing agents convert it into acetic acid. If a drop of strong sulphuric acid is added to aldehyde, the latter is transformed into *paraldehyde*, a colorless, transparent liquid having the molecular formula $C_6H_{12}O_3$; it has a strong characteristic odor and a somewhat burning taste; if cooled below 0° C., it solidifies, forming crystals which melt at 10.5° C. Paraldehyde is moderately soluble in water, its solubility decreasing with an increase of temperature. If taken internally in doses of from one to four cubic centimeters, paraldehyde produces sleep without affecting the heart; it is, therefore, used as a substitute for chloral, though it has the disagreeable effect of imparting a persistent and offensive odor to the breath. Paraldehyde may be readily reconverted into aldehyde by distilling with dilute sulphuric acid. By the action of acids on aldehyde at a low temperature, another compound having the same percentage composition as aldehyde is obtained; this compound is called *metaldehyde;* it is colorless, crystalline, insoluble in water, and is readily converted into aldehyde by heating with dilute acids. Aldehyde was first isolated and studied by Liebig in 1835.

ALDEHYDES (clipped form of *al*cohol *dehyd*rogenatum, alcohol deprived of hydrogen). An important class of organic chemical compounds characterized by the group CHO. The aldehydes are derived from the primary alcohols (see ALCOHOLS) by removing part of the hydrogen of the latter by means of an oxidizing agent. Thus, when ethyl alcohol is oxidized with aqueous chromic acid, ordinary aldehyde is produced according to the following chemical equation:

$$\underset{\text{Ethyl alcohol}}{CH_3CH_2OH} + O = \underset{\text{Aldehyde}}{CH_3CHO} + H_2O$$

Most of the aldehydes are volatile liquid compounds, and are readily converted by oxidizing agents into the corresponding organic acids. Thus benzaldehyde (benzoic aldehyde) is readily oxidized to benzoic acid, according to the following equation:

$$\underset{\text{Benzaldehyde}}{C_6H_5CHO} + O = \underset{\text{Benzoic acid}}{C_6H_5COOH}$$

The aldehydes react with a great variety of substances, and by the use of them chemists have been able to obtain a large number of valuable organic compounds. Among the characteristic reactions of the aldehydes may be mentioned the following:

1. Being powerful reducing agents, the aldehydes form a mirror of metallic silver when heated in a glass vessel with an ammoniacal solution of silver nitrate to which some caustic soda has been added.

2. By the action of phosphorus pentachloride, the oxygen atom of the aldehyde group (CHO) is replaced by two atoms of chlorine. Thus, by the action of phosphorus pentachloride upon ordinary aldehyde, ethylidene chloride may be obtained according to the following equation:

$$\underset{\text{Aldehyde}}{CH_3CHO} + PCl_5 = \underset{\substack{\text{Ethylidene}\\\text{chloride}}}{CH_3CHCl_2} + POCl_3$$

It will be remembered that by the same reagent the hydroxyl group OH of alcohols and acids is replaced by one atom of chlorine. Thus ordinary alcohol is transformed into ethyl chloride, according to the following equation:

$$\underset{\text{Ethyl alcohol}}{C_2H_5OH} + PCl_5 = \underset{\text{Ethyl chloride}}{C_2H_5Cl} + POCl_3 + HCl$$

3. The aldehydes combine with alcohols to form compounds called *acetals*. Thus, ordinary acetal may be obtained according to the following equation:

$$\underset{\text{Aldehyde}}{CH_3CHO} + \underset{\text{Alcohol}}{2C_2H_5OH} = \underset{\text{Acetal}}{CH_3CH\left\langle\begin{matrix}OC_2H_5\\OC_2H_5\end{matrix}\right.} + H_2O$$

4. The presence of an aldehyde in a sample submitted for examination (or the presence of the aldehyde group CHO in a compound) may be demonstrated by adding the substance to a solution of a rosanilin salt that has been bleached by sulphurous acid (SO_2): the appearance of a

red coloration indicates the presence of an aldehyde.

5. When treated with nascent hydrogen, the aldehydes are reconverted into the alcohols from which they are derived; while, as has been stated above, oxidizing agents transform aldehydes into the corresponding acids. The aldehydes may, therefore, be said to be intermediate between the alcohols and the acids of organic chemistry.

ALDEN, ąl′den, BRADFORD R. (1800-70). An American soldier. He was born at Meadville, Pa., and in 1831 graduated at West Point, where he was an instructor from 1833 to 1840. He subsequently served for two years as aide to General Scott, and from 1845 to 1852 was commandant of cadets at West Point. In 1853 he organized and led an expedition against the Rogue River Indians, and in a fierce battle, fought near Jacksonville, Oregon, was so severely wounded that he was soon afterward forced to retire permanently from the army.

ALDEN, HENRY MILLS (1836—). An American editor and author, born at Mount Tabor (near Danby), Vermont. He graduated in 1857 at Williams College, where James A. Garfield and Horace E. Scudder were among his fellow-students, and in 1860 at the Andover Theological Seminary. Subsequently he was licensed to preach, but never took orders. From 1863 to 1869 he was managing editor of *Harper's Weekly*, and in the latter year became editor of *Harper's Monthly*. In 1863-64 he lectured before the Lowell Institute, Boston, on "The Structure of Paganism." He is known as a classical student of large acquirements, particularly in connection with Greek literature and thought; and his first literary ventures were two articles contributed to the *Atlantic* on the Eleusinian Mysteries. His long editorial service has been unobtrusive but distinctive. His personality has pervaded *Harper's Magazine*, in which he has aimed, among other things, to recognize the novice, and to encourage the best type of Americanism. He collaborated with A. H. Guernsey in the preparation of *Harper's Pictorial History of the Great Rebellion* (1862-65); and has published *The Ancient Lay of Sorrow*, a poem (1872), and two profound metaphysical essays, *God in His World* (1890, published anonymously), and *A Study of Death* (1895), both extensively read and enthusiastically received by critics and thinkers. He received the degree of L.H.D. from Williams in 1890.

ALDEN, MRS. ISABELLA McDONALD (1841—). An American author, who writes under the pseudonym of "Pansy." She was born at Rochester, N. Y., and in 1866 was married to the Rev. Dr. G. R. Alden. In addition to much fiction for older readers, her works include the *Pansy Books*, a series of about sixty juvenile works. She edited the young folks' journal *Pansy* from 1873 until 1896, and has been on the editorial staff of the *Christian Endeavor World*, of Boston, and various other religious magazines of Boston, Philadelphia, and New York. Her works have been translated into many foreign languages.

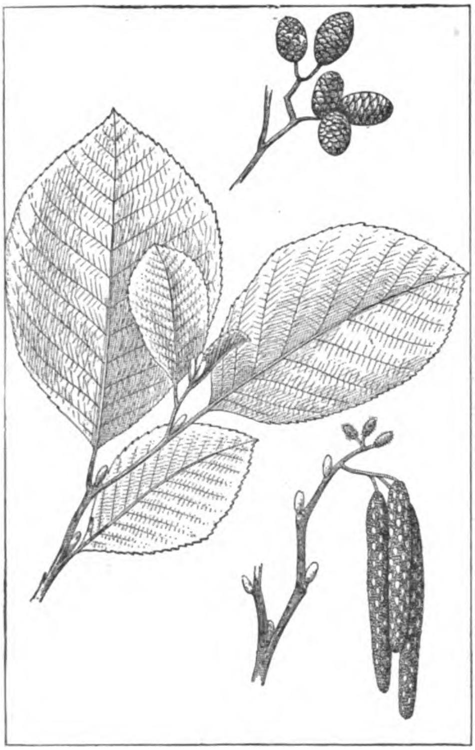
ALDEN, JAMES (1810-1877). An American naval officer, born in Portland, Me. He entered the navy as midshipman in 1828, was in the Wilkes exploring expedition to the Antarctic (1838-42), in several naval operations of the Mexican War (1848), and from 1848 to 1860 in the coast survey. In the Civil War he commanded the sloop-of-war *Richmond* at the capture of New Orleans and the attack on Port Hudson. He was promoted to be captain in 1863, and commanded the sloop *Brooklyn* in Mobile Bay and at Fort Fisher. He became a commodore in 1866, was placed in command of the Mare Island (Cal.) navy yard in 1868, and in 1869 was appointed chief of the bureau of navigation. He was promoted to the rank of rear admiral in 1871 and took command of the European squadron; he was retired in 1873.

ALDEN, JOHN (1599-1687). One of the Pilgrim Fathers. He was born in England. As a cooper, he was engaged in making repairs on the *Mayflower* at Southampton, and sailed in her, signing the compact. He settled at Duxbury, Mass., and married Priscilla Mullens. Their courtship formed the theme of Longfellow's poem, *The Courtship of Miles Standish*. He was a magistrate for more than fifty years, and greatly assisted in the government of the infant colony. He outlived all of the other signers of the compact.

ALDEN, TIMOTHY (1819-1858). An American inventor of a machine for setting and distributing type. He was born at Barnstable, Mass., and was sixth in descent from John Alden, the *Mayflower* Pilgrim. In early life he was a compositor in his brother's printing office, and while thus engaged is said to have declared: "If I live long enough I will invent a machine to do this tiresome work." After the inventor's death the machine was improved by Henry W. Alden.

ALDEN, WILLIAM LIVINGSTON (1837—). An American author. He was born in Williamstown, Mass., and was educated at Lafayette and Jefferson colleges. In 1865 he joined the editorial staff of the New York *Times* and at once attracted attention by his humorous writings. During President Cleveland's first administration (1885-89) he was consul-general of the United States at Rome, and at the expiration of his term was made chevalier of the Order of the Crown of Italy by King Humbert. In 1893 he settled in London, and became literary correspondent of the New York *Times*. Among his publications are: *Domestic Explosions* (1878); *Shooting Stars* (1879); *Moral Pirates* (1881); *Life of Christopher Columbus* (1882); *Cruise of the Canoe Club* (1883); *A Lost Soul* (1892); *The Mystery of Elias G. Roebuck* (1896); *His Daughter* (1897), and *Dewitt's Dream* (1902).

ALDER, ąl′dẽr (Lat. *alnus*). A genus of plants of the natural order Betulaceæ. (See BIRCH.) The genus consists of trees and shrubs, natives of cold and temperate climates; the flowers in terminal, imbricated catkins, which appear before the leaves in some species, though in other species leaves and flowers appear simultaneously. In Alnus maritima the flowers appear in the autumn and the fruits ripen in the following season. The common or black alder (*Alnus glutinosa*) is a native of Great Britain and of the northern parts of Asia and America. It has roundish, wedge-shaped, obtuse leaves, lobed at the margin and serrated. The bark, except in very young trees, is nearly black. It succeeds best in moist soils, and helps to secure swampy river-banks against the effects of floods. It attains a height of 30 to 60 feet. The wood is of an orange-yellow color. It is not very good for fuel, but affords one of the best kinds of charcoal for the manufacture of gunpowder, upon which account it is often grown as coppice-wood. Great numbers of small alder trees are used in Scotland for making staves for herring barrels. The wood is particularly valuable on account of its property of remaining for a long time under water without decay, and is therefore used for the piles of bridges, for pumps, sluices, pipes, cogs of mill-wheels, and similar purposes. The bark is used for tanning and for dyeing. It produces a yellow or red color, or, with copperas, a black color. The leaves and female catkins are employed in the same way by the tanners and dyers of some countries. The bark is bitter and astringent. The individual tree, viewed by itself, may be regarded as somewhat stiff and formal in appearance, but in groups or clusters it is ornamental. The northern limit of the common alder is the Swedish shore of the Gulf of Bothnia, in the south of Ångermannland, where it is called the sea alder, because it is only in the lowest grounds, near the sea, that it occurs. The gray or white alder (*Alnus incana*), a native of many parts of continental Europe, especially of the Alps, and also of North America and of Kamtchatka, but not of Great Britain, differs from the common alder in having acute leaves, downy beneath, and not glutinous. It attains a rather greater height, but in very cold climates and unfavorable situations appears as a shrub. It occurs on the Alps at an elevation above that to which the common alder extends, and becomes abundant also where that species disappears in the northern part of the Scandinavian peninsula. The bark is used in dyeing. Alnus cordifolia is a large and handsome tree, with cordate acuminate leaves, a native of the south of Italy, but found to be quite hardy in England. Some of the American species are mere shrubs. The bark of the smooth alder (*Alnus serrulata*), found from south New England to Wisconsin, Kentucky, and Florida, is used in dyeing. The green or mountain alder (*Alnus viridis*) ranges from north New England to the shores of Lake Superior, and northward and southward to North Carolina. Alnus oregona is a handsome species of the northern Pacific coast region. In the mountain regions of Alaska and elsewhere alders are the first arborescent growth to succeed conifers swept away by avalanches, etc.



ALDER LEAF AND CATKINS.

Fossil Forms. Leaves of a plant doubtfully allied to the alder have been described from the Cretaceous rocks of Greenland and North America under the name Alnophyllum, while true alders attained a considerable degree of development in Tertiary time throughout the northern parts of Europe, Asia, and Africa.

ALDER FLY. An insect of the family Sialidæ. See Corydalis.

ALDERMAN, ạl′dẽr-man. The designation used in the United States for the representative of the citizens of a district or ward in a city or large town, whose duty it is to attend the local legislature and enact municipal regulations. The title originally derived from the Anglo-Saxon *ealdorman*, compounded of *ealdor*, older, and *man*, and applied to persons of high and hereditary distinction, such as princes, earls, and governors. Whether any definite and invariable functions were connected with the ancient rank of *ealdorman* does not seem to be very clearly ascertained. Its special signification in the titles, "Alderman of all England" (*aldermannus totius Angliæ*) and "King's Alderman" (*aldermannus regis*) is not distinctly indicated. There were also aldermen of counties, hundreds, cities, boroughs, and castles. At present in England, Wales, and Ireland, aldermen are officers invested with certain powers in the municipal corporations, either as civil magistrates, or as deputies of the chief civil magistrates in cities and towns corporate. The corresponding title in Scotland is bailie. In the majority of American cities, aldermen form a legislative body, having limited judicial powers in matters of internal police regulation, etc., though in many cities they hold separate courts and have magisterial powers to a considerable extent. (See sections on Local Government in the articles on the important countries, and articles on American cities.)

ALDERMAN, Edwin Anderson (1861—). An American educator, born at Wilmington, N. C., and educated at the university of that State. He was professor of English in the North Carolina State Normal College in 1892; professor of pedagogy at his alma mater in 1892-96, and president of this institution in 1896-99. In June, 1904, he became president of the University of Virginia. He also served as district director of the Southern Education Board.

ALDERMAN LIZ′ARD. The name, in California, of the obese Chuckwalla (q.v.).

ALDERNEY, ạl′dẽr-nĭ (Fr. *Aurigny*, the *Riduna* of Antoninus). One of the Channel Islands (q.v.), separated from Cape La Hague, France, by a perilous channel, 7 miles wide, called the Race of Alderney. It is 4½ miles long. with an extreme breadth of 1½ miles and an area of 3 square miles (1962 acres) (Map: France. D 2). The southeast coast is lofty and bold; it slopes to the northeast and north, forming small bays. It is strongly fortified, and at Braye there is an extensive granite breakwater, built at an enormous expense by the British Government in order to form a naval station and harbor of refuge, but of little value. St. Anne, in the centre of the island, is the chief town. Alderney is included in the baliwick and governorship of Guernsey, but has minor legislative and judicial administrations locally elected. The dangerous Casket rocks, surmounted by three splendid lighthouses, lie 6 miles southwest. Pop., 1891, 1857; 1901, 2062.

ALDERNEY CATTLE. See Cattle.

ALDERSGATE, ạl'dẽrz-gāt. In the old city wall of London, the gate which stood at the present junction of Aldersgate Street and St. Martin's-le-Grand. It was between Cripplegate and Newgate. It was rebuilt in 1616, with figures of King James I. and of the prophets Jeremiah and Samuel.

ALDERSHOT, ạl'dẽr-shŏt (for *Aldersholt; holt*, a wood, Ger. *Holz*, wood). A town in Hampshire, England, 14½ miles east of Basingstoke (Map: England, E 5). Its importance arises from the vicinity of the great Aldershot military camp. It is a busy junction of the London and Southwestern Railway, with two depots, and has all the elements of a thriving town. Pop., 1891, 25,595; 1901, 30,974.

ALDERSHOT CAMP. A permanent camp of the British army, situated about 35 miles southwest of London, England, and used during the spring and summer for army manœuvres on a larger scale than is possible elsewhere in the kingdom. Up to the Boer War of 1899, the Aldershot garrison consisted of troops available for service with the first army corps. It is also used by volunteers and militia during their annual training, and is the headquarters for various military instruction.

ALDGATE, ạld'gāt'. The eastern gate in the old city wall of London, near the present junction of Houndsditch, Aldgate High Street, and the Minories. Its date and the origin of the name have been much disputed. The gate probably dated from the late Saxon or early Norman period, and the name, spelled *Alegate* in a document earlier than 1115, seems to mean the "gate free to all."

ALDHELM, äld'hĕlm (c. 640-709). An ecclesiastic, possibly a son of the King of the West Saxons. He was educated at Canterbury, became abbot of Malmesbury about 676, and Bishop of Sherborne in 705, but continued to act as abbot of his monasteries. He was a famous scholar. His works are found in Migne, *Patrologia Latina*, vol. lxxix.

ALDIE, ạl'dĭ. A village of Loudoun County, Va., about 35 miles west of Washington, D. C. Here, on June 17, 1863, a force of Federal cavalry under Pleasonton defeated a force of Confederate cavalry under Stuart.

ALDINE (ăl'dīn *or* ạl'dīn) **EDITIONS.** A name given to the books printed by Aldus Manutius and his family, at Venice (1490-1597), prized for their scholarly correctness, beautiful typography, and tasteful manufacture, and, latterly, for their rarity. They include editions of Greek, Latin, and Italian writers, in many cases the earliest printed. The first Aldus was an innovator. He first used italic type (1501) and introduced fine paper or parchment editions (1499). He was an artist in the designing of type, having nine varieties of Greek and fourteen of Roman letters. The establishment remained for more than a century in the family, and produced 908 works, which bear its imprint of an anchor with twisted dolphin, often with the Latin motto, *Sudavit et Alsit*. As the editions gained in reputation, they were often counterfeited by printers in Lyons and Florence. The most precious are those of the first twelve years, especially *The Hours of the Blessed Virgin* (1497) and the *Vergil* (1501). See Manutius.

ALDINI, ȧl-dē'nė, Antonio (1756-1826). An Italian statesman, born in Bologna. He studied law in Rome and became professor of that subject and a practising barrister there. After the separation of Bologna from the Papal States, he went to Paris, and upon his return became president of the Council of Ancients of the Cisalpine Republic. He was dismissed from this position in 1798 because of his opposition to the measures of Napoleon, who, however, in 1801, made him president of the Council of State of the Italian Republic. Of this position he was deprived by Melzi. When the Kingdom of Italy was formed in 1805, Aldini was made a count, and Secretary of the Interior, in which capacity he drew up the decree dissolving the Papal States. After 1815 he lived in retirement at Milan.

ALDINI, Giovanni (1762-1834). A nephew of the famous Galvani and brother of Count Antonio Aldini; a student of natural science. He held the chair of physics at Bologna, was a founder of the National Institute of Italy, received the British Royal Society's gold medal, and was made Knight of the Iron Crown and Councilor of State at Milan. He spent much of his fortune in organizing a school of science for workingmen at Bologna. He carried on investigations in applied science, and worked out methods of applying galvanism to various useful purposes in medicine and in the industrial arts.

ALDOBRANDINI, äl'dȯ-brȧn-dē'nė. A noble family of Florence, raised to the princely dignity by Pope Clement VIII. Silvestro Aldobrandini (1499-1588). A famous teacher of law at Pisa. He was banished by the Medici upon his return to Florence in 1530, and went to Rome, Naples, and Bologna, where, in 1538, he became papal vice-legate and vice-regent. Realizing the futility of a return to Florence, he went to Ferrara, whence he was called to Rome as fiscal advocate of Pope Paul III. Ippolito Aldobrandini (1536-1621). A son of the preceding. He became Pope, with the title of Clement VIII. (q.v.). Pietro Aldobrandini (1571-1621). Cardinal; a nephew of Pope Clement VIII. He continued the policy of Clement and zealously promoted the development of the sciences. The great sums of money which he had accumulated he sought to secure by the purchase of Sulmona, Bari, and Bisignano. He became Archibishop of Ravenna under Pope Paul V. When the Roman branch of the family became extinct (1681), a dispute as to inheritance and succession arose between the Borghese and the Pamfili branches, and the princely title, as well as the greater part of the fortune, passed to the Borghese branch.

ALDOBRANDINI MAR′RIAGE, The. A famous mural painting in the Vatican Library, found in 1606 at Rome, and named after its original owner, Cardinal Aldobrandini. It is probably of the time of Augustus. Some think it the marriage of Peleus and Thetis, others of Paris and Helen, and still others simply an ideal. It presents the appearance of a frieze.

ALDO MANUZIO, äl′dô mȧ-nōō′tsê-ō. See Manutius.

ALDRED, äl′drĕd (?-1069). A noted English ecclesiastic. He became Abbot of Tavistock about 1027 and Bishop of Worcester, 1044. He made a pilgrimage to Jerusalem in 1058; was elected Archbishop of York in 1060, and died September 11, 1069. He was very influential under Edward the Confessor, by whom he was employed on embassies. He submitted to and crowned William the Conqueror. He was avaricious, but capable and honest, instituting many reforms, and spending his wealth freely in the service of the Church.

ALDRICH, ạl′drĭch *or* ạl′drĭj, Anne Reeve (1866-92). An American poet and novelist, whose few works gave promise of a brilliant future. She was born at New York, April 25, 1866, and died there June 22, 1892. Her first work, *The Rose of Flame* (1889), was followed by *The Feet of Love*, a novel, in 1890. *Songs About Life, Love, and Death* appeared posthumously in 1892. The general characteristic of her works is intense, passionate, and erotic.

ALDRICH, Henry (1647-1710). An English theologian, musician, and architect, dean of Christchurch College, Oxford, from 1689. He wrote a treatise on logic, *Artis Logicæ Compendium* (1691), which, with notes by Dean Mansel, was used as a text-book at Oxford for more than a century. He designed several of the buildings at Oxford, but is best known for his musical attainments. He wrote on the history of music, and composed services, anthems, and catches. His extensive musical library, second only to that of the British Museum, he left to Christ Church.

ALDRICH, Nelson Wilmarth (1841—). An American politician, born at Foster, R. I. In 1875-76 he was a member of the Rhode Island House of Representatives, and in the latter year its Speaker. He was elected to Congress in 1878 and 1880. In 1881 he resigned to take a seat in the Senate. He was reëlected to the Senate in 1886, 1892, 1898, and 1904. Previously a prominent member of the committee on civil service and finance, he was chairman of the committee on rules in the Fifty-fifth Congress. He has rarely taken part in debate, but has been recognized as a careful legislator, and a Republican leader in the Senate.

ALDRICH, Thomas Bailey (1836—). An American poet, novelist, traveler, and editor. He was born at Portsmouth, N. H., November 11, 1836. After a boyhood spent in New England and Louisiana, he entered a counting-house in New York in 1854. He was employed as "reader" in a publishing house in 1857, and he served successively on the staffs of the New York *Evening Mirror*, the *Home Journal*, and the *Saturday Press*. In 1866 he removed to Boston, where he was editor of *Every Saturday* until 1874. He then became a regular staff contributor to the *Atlantic Monthly*, and on the retirement of W. D. Howells, in 1881, succeeded to the editorship, which he held until 1890. Afterward, he devoted himself to literary work and travel. Aldrich is best known as a poet. He has, not very aptly, been called "the American Herrick," owing to the fact that his verse is graceful, light, and melodious, carefully wrought, restrained, and reminiscent of places that he has visited. His chief publications of verse, besides the collective editions, are: *The Bells* (1855), *The Ballad of Babie Bell* (1856), *Pampinea, and Other Poems* (1861), *Cloth of Gold, and Other Poems* (1874), *Flower and Thorn* (1876), *Friar Jerome's Beautiful Book* (1881), *Mercedes, and Later Lyrics* (1883), *Wyndham Towers* (1889), *Unguarded Gates, and Other Poems* (1895). Like the poetry, Aldrich's prose is delicate and finished in style. His best-known piece of fiction is probably *Marjorie Daw* (1873); and his *Story of a Bad Boy* (1870) is also very popular. Other novels are: *Out of His Head, a Romance* (1862), *Prudence Palfrey* (1874), *The Queen of Sheba* (1877), *The Stillwater Tragedy* (1880), and *Two Bites at a Cherry* (1893), a volume of short stories. His volumes of travel and reminiscence are: *From Ponkapog to Pesth* (1883) and *An Old Town by the Sea* (1893). In 1905, he published, in blank verse, a tragedy, *Judith of Bethulia*, which was played by Miss Nance O'Neill.

ALDRIDGE, al′drĭj, Ira Frederick (c. 1810-1867), "The African Roscius." There are conflicting accounts of his early life. One is that he was a mulatto, born at Bel Air, Md., about 1810, was apprenticed to a German ship carpenter, accompanied Edmund Kean to England as a servant, returned in 1830 or 1831, and appeared on the stage in Baltimore without success; after which he went back to England and gained a high reputation. Another story is that he was the son of a native of Senegal, who was brought here as a slave, became a Christian, and pastor of Greene Street Chapel (African) in New York; that Ira was born in that city in 1807, and was sent to Glasgow University to be educated for the ministry. Preferring the drama, however, he made his début at the Royalty Theatre, London, as Othello, and became remarkably popular. He played also Aaron, in *Titus Andronicus* (1852), and Zanga, Orozembo, Rolla, and other characters for which his color was suited, throughout England. At Belfast he played Othello to the Iago of Edmund Kean, who greatly admired him. In 1852 he appeared in Brussels, and thereafter on the Continent took high rank in tragedy. He received crosses and medals from the emperors of Austria and Russia and the King of Prussia, and was honored with membership in several of the great academies. He married an Englishwoman.

ALDRINGER, äl′drĭng-ẽr, also Altringer, or Aldringen, Johann, Count (1588-1634). A general in the imperial German army during the Thirty Years' War. He was born at Diedenhofen and studied at the University of Paris. As a reward for his defense of the Elbe bridge at Dessau, April, 1626, against Mansfeld, he was created a count in 1628. He was in high favor with Wallenstein, and after the conclusion of peace with Denmark was appointed major-general. In this capacity he served with distinction under Collalto at the siege of Mantua. On his return to Germany, in 1631, he coöperated with Tilly, and, upon the death of that commander (1632), became his successor. As field-marshal, he afterward conducted a successful campaign in Franconia, Bavaria, and Swabia against the Swedes. Eventually influenced by the Court party against Wallenstein, he defended the imperial cause, although he adroitly evaded the order to take Pilsen. After Wallenstein's death, he fought against the Swedes on the Danube, where soon afterward he met his death.

ALDROVANDI, äl'drō-vän'dē, Ulisse (1522-1605). An Italian naturalist. He was of noble birth. He became, in 1554, a professor of philosophy and logic, and in 1560 lectured on botany in the University of Bologna. He also practiced medicine, and succeeded, after violent popular opposition, in establishing an inspectorship of drugs and pharmacies. The Pope confirmed him in the office. Afterward he became professor of natural history, established the Botanical Garden of Bologna in 1567, and was employed for many years in forming a collection of specimens as a basis for an encyclopædic work on animal life. To this end he traveled extensively, and enlisted the aid of Gesner and others. In this work, and in the preparation of drawings, he expended the greater part of his fortune. He ceased teaching in 1600, and devoted himself to the publication of his great work, issuing four volumes in Latin on ornithology (1559-1603), and one on mollusks. He bequeathed his collections and manuscripts to the Senate of Bologna; the collections became the nucleus of the great museum of that city, and the manuscripts remained in the university library. Ten other volumes, more or less prepared by him, were rapidly brought out by his colleagues and pupils; but many manuscripts and drawings remain unpublished. He did a great service in stimulating scientific study, and collected an enormous number of facts and specimens; but his writings were prolix and not discriminative. Nevertheless, some volumes, as those on birds, rapidly ran through several editions, and the entire series was epitomized by Johnstone. Consult his biography by G. Fantuzzi (Bologna, 1774).

ALDUS, äl'dŭs. See Manutius, Aldus.

ALE. See Beer and Brewing.

AL'EAN'DER, Hieronymus (1480-1542). An Italian humanist and papal legate. He was born at Motta, near Treviso, and after a short course in medicine devoted himself to the study of theology and languages. He entered the service of the Bishop of Liège, Eberhard of the Mark, in 1514, and in 1519 he went as papal legate to Germany, to combat the Lutheran movement. He inspired the famous edict of Charles V. against the reformer (May 26, 1521), a document antedated May 8, 1521, and probably emanating from the pen of Aleander. As legate to Germany in 1532, he unsuccessfully endeavored to frustrate the Peace of Nuremberg. In 1536 Pope Paul III. appointed him a member of the reform commission under Contarini (q.v.), and two years afterward he was created cardinal and was again sent to Germany; but his mission proved unproductive of results. His letters and reports are valuable historical documents, and his celebrated writing, *De Concilio Habendo*, is said to have been consulted at the Council of Trent. For his biography down to 1529, consult: J. Paquier (Paris, 1900); also in general, Brieger, *Aleander und Luther, 1521* (Gotha, 1884); Kelkoff, *Die Depeschen Aleanders vom Reichstag zu Worms* (Halle, 1886).

ALEARDI, ä'lā-är'dē, Aleardo (1812-78). An Italian patriot and poet, formerly hailed as a rival of Prati. He was born at Verona, studied law at Padua, and was active in the outbreak of 1848. His connection with later conspiracies finally caused his imprisonment in Josefstadt, where he remained until liberated by the peace of 1866. He subsequently became professor of æsthetics at Florence, deputy in the Italian Parliament, and finally senator. He died at Verona, which has perpetuated his memory by a monument and by a bridge named in his honor. Aleardi's poems will live on account of their artistic finish and their delicate appreciation of nature; but they are marred by a prevailing lack of force and are overburdened with imagery. The best include: *Il monte Circello*, *Un' ora della mia giovinezza*, and *I sette soldati*, which was dedicated to Garibaldi. The best edition of his collected poems appeared at Florence (1862).

ALECSANDRI, ä'lĕk-sän'drē, or **ALEXANDRI**, Vasilio, or Basil (1821-1890). A Rumanian patriot and poet. He was born at Jassy, studied at Paris from 1834 to 1839, took part in the revolutionary movement of 1848 in Rumania, and was obliged to seek refuge in Paris. In 1859 and 1860 he was Minister for Foreign Affairs, was elected to the upper chamber in 1879, and in 1885 was appointed Minister at Paris. He was always active in seeking the freedom and unity of Rumania. He collected *Poesii populare a le Romanilor* (1853), and wrote *Les doines* (1853) and *Doine si lacrimioare* (1863), two volumes of verse, and the dramas *Despot Voda* ("Prince Despot," 1880) and *Fontana Bandusiei* (1884). His *Opere* appeared in seven volumes in 1873-76.

ALEC'TO (Gk. 'Αληκτώ, *Alĕktō*, from ἀ, *a*, priv. + λήγειν, *lēgein*, to stop, to cease). The name of one of the three Eumenides (q.v.).

ALEC'TROMAN'CY. See Superstition.

AL'EDO. A city and the county-seat of Mercer County, Ill., 180 miles west by south of Chicago, on the Chicago, Burlington and Quincy Railroad (Map: Illinois, B 2). It contains the Mercer County Library. The city has commercial interests, principally in agricultural produce, and some manufactures, including tile, brick, and tobacco. Pop., 1890, 1601; 1900, 2081.

ALEE'. See Helm.

ALEGRIA, à-lā'grē-à. A town of Cebú, Philippines, 90 miles from Cebú. Pop., 1903, 9579.

ALEMAN, ä'lā-män', Mateo. A famous Spanish novelist, born at Seville about the middle of the sixteenth century. Little is known of his life except that he took his bachelor's degree at Seville in 1565, was appointed to the royal treasury in 1568—a position which he resigned after twenty years as poor as when he assumed it—and is supposed subsequently to have gone to America, and to have died in Mexico during the reign of Philip III. His writings include a poetical biography of St. Anthony of Padua

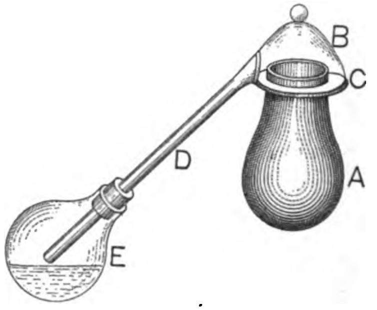
(1604) and an *Ortografia castellana* (Mexico, 1608). His great work, however, is *Guzman de Alfarache* (1599), a novel with a rogue for the hero, which revives the picaresque tradition of Mendoza's *Lazarillo de Tormes*. *Guzman* at once became exceedingly popular, and within six years had run through twenty-six editions, aggregating upward of 50,000 copies, besides being translated into French and Italian. In 1623 James Mabbe published the first English version, of which Ben Jonson wrote: "This Spanish Proteus, though writ but in one tongue, was formed with the world's wit." Both in the delineation of manners and in the purity of style, *Guzman* ranks next to *Lazarillo*, which is recognized as the enduring type of the comic prose epic. While lacking Mendoza's originality, conciseness, and caustic humor, Aleman shows keen powers of observation and a wide knowledge of human nature; and in *Guzman* he has given the world a most diverting study of blackguardism, his hero showing all the resources of a consummate rascal in the various characters of stable boy, beggar, thief, coxcomb, mercenary, valet, and merchant. The book, however, is marred by the moral reflections of the author, which obtrude themselves with somewhat wearisome persistence. The best edition of Aleman is found in Aribaus's *Biblioteca de autores españoles*, vol. iii. (Madrid, 1846).

AL'EMAN'NI, more correctly spelled Alamanni (probably, "all men"). The name of a military confederacy of several German tribes which began to appear on the lower and middle Main about the beginning of the third century. Caracalla fought with them first on the Main in 211 A.D., but without conquering them; Alexander Severus was equally unsuccessful, but Maximinus finally drove them beyond the Rhine. After his death they again invaded Gaul, but were defeated by Postumus, who pursued them into Germany, and fortified the boundary of the Roman territory called the Agri Decumates. The mounds near Pförung, on the Danube, the rampart extending through the principality of Hohenlohe to Jaxthausen, and the ditch with palisades on the north side of the Main, are remains of the fortifications. The Alemanni, however, did not desist from their incursions, although repeatedly driven back. After 282, being pressed upon from the northeast by the Burgundians, they made permanent settlements within the Roman boundary from Mainz to Lake Constance. At last Julian came (357) to the relief of Gaul, which had been suffering from the incursions of the Alemanni, and soon compelled eight chiefs to sue for peace. Their united force, in their principal battle with Julian, amounted to 35,000 men. After the fifth century the confederated nation is spoken of as Alemanni and Suavi or Suevi. During the fourth century they had crossed the Rhine, and extended as far west as the Vosges, and south to the Helvetian Alps. At length Clovis broke their power in 496, and made them subject to the Frankish dominion. The southern part of their territory was formed into a duchy, called Alemannia. The name of Swabia was later applied to the part of the duchy lying east of the Rhine. From the Alemanni the French have given the name of Allemands and Allemagne to Germans and Germany in general, though the inhabitants of the north of Switzerland, with those of Alsace and part of Swabia, are the proper descendants of the Alemanni.

AL'EMAN'NIA, or **AL'AMAN'NIA**. The country of the Alemanni (q.v.). The region included part of the later Switzerland and Tyrol. In the tenth and eleven centuries Alemannia, or Swabia (q.v.), was one of the four great duchies of the German kingdom.

ALEMBERT, ȧ'läɴ'bâr', Jean le Rond d'. See D'Alembert.

ALEM'BIC (formed by the Arabs from their article *al* and Gk. ἄμβιξ, *ambix*, a goblet). A form of still introduced by the alchemists, who used it in manipulative chemistry for distillation and sublimation. The vessel consisted of a body, cucurbit or matrass, *A*, in which the material to be volatilized was placed; a head or capital, *B*, into which the vapors rose, were cooled, and then trickled to the lower part, *C*, whence by a pipe, *D*, the distilled product passed into the receiver, *E*. When very volatile liquors were distilled, it was customary to introduce the receiver, *E*, into a vessel with cold water, so as to increase the effectiveness of the condensing part of the arrangement. The alembic has now been entirely superseded by the retort and receiver, or by the flask attached to a Liebig's condenser.



ALEMBIC.

ALEMTEJO, ä'läɴ-tā'zhō (literally, in Portuguese, "beyond the Tagus"). A province in the south of Portugal, bounded by the province of Beira on the north, Spain on the east, Algarve on the south, Estremadura and the Atlantic Ocean on the west (Map: Portugal, B 3). Area, 9431 square miles. Alemtejo is the largest and most sparsely populated province of Portugal. The eastern and southern parts are covered with low mountains, rising to nearly 2000 feet on the southern frontier. The chief rivers are the Guadiana, Tagus, and Sado. The climate is hot and dry. The fertile plains are found chiefly in the northeast, where wheat, barley, corn, and fruit are raised in considerable quantities. The rearing of domestic animals is also important. The manufacturing industries and commerce are utterly neglected, and the rich mineral resources are left untouched. Administratively, Alemtejo is divided into the three districts of Portalegre, Evora, and Beja. Pop., 1890, 388,813.

ALENCAR, ä'lân-kär', José Martiniano d' (1829-77). A Brazilian jurist and novelist, born at Fortabza. He studied law at São Paulo, and became a brilliant advocate. In 1868 he was elected deputy for Ceará as a Conservative, and in 1868-69 was Minister of Justice. His works, chiefly fiction, most of the material for which is drawn from Indian legend, include *O Guarany*, *Iracema*, *O Gaucho*, and *Urabijara*.

ALENÇON, *Fr.* ȧ'läɴ'sôɴ'; *Eng.* ȧ-lĕn'sŏn. The capital of the department of Orne, in Normandy, France, situated on the Sarthe (Map: France, G 3). It is one of the brightest and freshest looking towns in France. It is the seat of a bishop, and the cathedral is its principal building. Three battlemented towers, the only portion of the old castle which remains, are used as the Hôtel de Ville. The town church—a structure of the sixteenth century, containing the remains of the tombs of the Alençon family, which were almost completely destroyed at the Revolution—is built in the Gothic style. The inhabitants produce excellent woolen and linen stuffs, embroidered fabrics, straw hats, lace, artificial flowers, hosiery, etc. The manufacture of point d'Alençon, and of Alençon diamonds, is no longer important. Pop., 1901, 17,270. Consult Odolant-Desnas, *Mémoires historiques sur la ville d'Alençon* (Alençon, 1787).

ALEP'PO (Ar. *Haleb*). One of the most important cities of Syria, and capital of the Turkish vilayet of Aleppo (33,436 square miles; pop., 995,800) (Map: Turkey in Asia, G 4). It is about 80 miles east of the Mediterranean Sea, on the desert stream of Nahr-el-Haleb, in about 36° 12′ N. lat., and 37° 12′ E. long. It is surrounded by hills, and has regular and clean streets. In the northwestern part stands the citadel, situated on a hill and surrounded by a deep moat. The town was formerly surrounded by a strong wall, of which only a small portion is left, the remainder, together with many of the public buildings, having been destroyed by the earthquake of 1822. The bazaar is extensive and well built. The European colony of Aleppo is considerable, and there are several European schools and Christian churches. Among the mosques the most noteworthy is the Great Mosque, or *Jami Sakarya*, containing the alleged remains of Zacharias, the father of John the Baptist. Before the earthquake of 1822, and repeated visitations of the plague and cholera, Aleppo was a great commercial centre in spite of its inland position. It supplied a large part of the Orient with various fabrics of wool, cotton, silk, and silver and gold ware. The trade is still considerable, and its chief exports are wool, cotton, grain, gums, saffron, sesame, and hides. Some silk, embroidery, and leather goods are manufactured. The chief port of Aleppo is Alexandretta (q.v.). The importation of European goods by native merchants is increasing rapidly. Aleppo is the seat of a United States and several European consuls. The population is estimated at 125,000, including about 20,000 Christians, 5000 Jews, and some Armenians. Aleppo is believed to be of great antiquity. In ancient times its name was Berœa, given to it by Seleucus Nicator. It was attacked and taken repeatedly by the Saracens and Mongols, and suffered considerably from earthquakes during the twelfth century. In 1516 Aleppo was wrested from the Mamelukes by the Turkish Sultan Selim, and it became the capital of a pashalic. The city is supposed to have contained in those times about 300,000 inhabitants, and carried on a large trade by caravans, which subsequently fell off on account of the discovery of the sea route to the East Indies. In 1850 there was an uprising of Christians, suppressed only after considerable bloodshed. Consult E. Blochet, "L'histoire d'Alep," in the *Revue de l'Orient Latin* (Paris, 1897).

ALEPPO BUT'TON. See BOIL.

ALER, ä'lĕr, PAUL (1656-1727). A Jesuit and scholastic, born at St. Veit, Luxemburg. After teaching at Cologne, he became professor of theology at Trèves, and in 1703 regent of the gymnasium of Cologne. In 1713 he became regent of the gymnasia at Aix-la-Chapelle, Münster, Trèves, and Jülich. His best known work is the *Gradus ad Parnassum* (Cologne, 1702); 8th revised edition by Koch (Cologne, 1879).

ALES, ä-lĕs', or **ALESSE**, ALEXANDER. See ALESIUS, ALEXANDER.

ALESHKI, ȧ-lĕsh'kē, formerly DNIEPROVSK. The chief town of a district, in the Government of Taurida, Russia. It is near the Dnieper River, 3 miles southeast of Kherson, and 153 miles northwest of Simferopol, the capital of the government (Map: Russia, D 5). Pop., 1897, 9100. It was founded by the Genoese in the tenth century and called by them Elice.

ALESIA, ȧ-lē'shĭ-ȧ. a town of Gaul, the capture of which, in B.C. 52, forms one of Cæsar's greatest exploits. The Gauls were making a last effort to shake off the Roman yoke, and Vercingetorix, their bravest leader, after several defeats, had shut himself up with 80,000 men in Alesia, there to await the reënforcements expected from a general insurrection. The town was on a lofty hill, and well calculated for defense. Cæsar, with 60,000 men, surrounded the place, with the view of starving it into a surrender. He fortified his position by two lines of ramparts of prodigious extent and strength; one toward the town, for defense against the sallies of the besieged; the other toward the plain, against the armies of relief. Before they could assemble, 250,000 strong, he was ready for them; and all their assaults, combined with the desperate efforts of the besieged, were of no avail. Alesia was obliged to surrender, and Vercingetorix was made prisoner. Alesia was afterwards a place of some note under the Empire, but was destroyed by the Normans in 864. Near the site of Alesia, west of Dijon, stands the modern village of Alise Sainte-Reine, near which, on the summit of Mont-Auxois, Napoleon III. erected a colossal statue of Vercingetorix.

ALESIUS, ȧ-lē'shĭ-ŭs, ALEXANDER (1500-65). A Protestant theologian. His original name was Ales, but he was also called Alesse, ab Ales, and Alane. He was born in Edinburgh, studied at St. Andrews, became a canon of the Collegiate Church, and contended vigorously for scholastic theology. He was appointed (1528) to refute the reformed views of the Scotch protomartyr Patrick Hamilton, but the result was that his own faith in the old church was shaken, though he long kept the fact secret. For a sermon against dissoluteness among the clergy he was put in prison (1531), whence he escaped to the Continent (1532), traveled in Europe, and settled in Wittenberg, where he met Melanchthon. Meantime he was condemned in Scotland (1534), for heresy, without a hearing. After Henry VIII. broke with the Church of Rome, Alesius went to England (1535), and was cordially received by the King, Cranmer, and Cromwell, and was appointed lecturer on theology at Cambridge. But he gave offense, and soon went to London and practiced medicine. In 1540 he returned to the Continent, and was chosen to a theological chair at Frankfort-on-the-Oder, the first professor who taught the reformed doctrines. In 1543 he quitted Frankfort for Leipzig, where he filled a similar professorship until his death. He visited England in 1549. He died at Leipzig.

ALESSANDRIA, ä'lĕs-sän'drē-ȧ. Capital of the Italian province Alessandria (1964 square miles; pop., 1901, 812,022; estimated pop., 1905, 830,435), a strong fortress in a marshy region on the Tanaro, 47 miles from Genoa by rail (Map: Italy, C 3). Its chief ecclesiastical buildings are the cathedral, built in the beginning of the nineteenth century, and the old Church of Santa Maria di Castello. There are a royal palace, an old castle, and extensive barracks. Noteworthy is the Academy of Sciences and Arts, founded in 1562. Alessandria has cotton, woolen, and linen mills, hat factories, etc. The city derives considerable commercial importance from its position on the chief railway lines of Eastern Italy. Population of commune, 1881, 62,464; 1901, 71,293.

Alessandria was founded in 1168 by the inhabitants of Cremona, Milan, and Placentia, as a bulwark against Frederick Barbarossa, and was named Alessandria in honor of Pope Alexander III. Frederick tried to capture it, but failed. As it was a fortress to guard the passage of the Bormida and Tanaro, and also the central point of communication between Genoa, Milan, and Turin, the town was often a scene of battle. It was taken and plundered in 1522 by Duke Sforza; besieged, but without success, by the French, under the Prince of Conti, in 1657; and taken, in spite of obstinate resistance, by Prince Eugene, in 1707. After the prostration of Austria at the battle of Marengo, in 1800, Bonaparte concluded an armistice at Alessandria, in accordance with which upper Italy, as far as the Mincio, was ceded to the French, with twelve fortresses. It was the principal stronghold of the Piedmontese during the insurrection of Lombardy and Venetia in 1848-49, when many new fortifications were added.

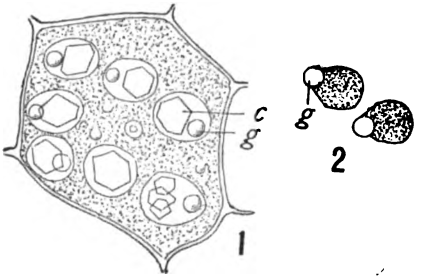
ALESSI, ȧ-lĕs'sē, GALEAZZO (1512-72). An Italian architect of the late Renaissance, born in Perugia. He was associated with Michelangelo at Rome in 1536, but followed more the manner of Vignola, adopting a formal, classic style. Aside from a few works at Perugia, his masterpieces are at Genoa, whose famous palace architecture he helped develop, especially in the Cambiaso, Spinola, and Serra palaces. Of his Genoese villas, the most beautiful is the Pallavicini. His influence was felt throughout Italy, and in France and Portugal, and Flanders.

ÅLESUND, ạ'le-sụnd, or **AALESUND**. A town in the Norwegian province of Romsdal, on two islands of the Skjärgaard Archipelago (Map: Norway, B 5). It has an excellent harbor, and is an important trading centre, getting a large revenue from cod-fishing. Pop., 1900, 11,700.

ALETIA. See COTTON INSECTS.

ALEU'ROMAN'CY, See SUPERSTITION.

ALEURONE, ȧ-lū'rōn (Gk. *ἄλευρον*, *aleuron*, wheaten flour). The stored proteid which occurs as minute granules in the food-bearing tissue (*endosperm*) and embryos of many seeds. The granules are much smaller than starch grains, with which they often occur. They are usually rounded in form (though the so-called proteid crystals of some plant tissues are angular), and may be simple or complex in structure. The more complex form of granule consists, in great part, of amorphous proteid substance, in which lie imbedded a large crystalloid and a much smaller globoid. The crystalloid is an angular mass of proteid material, differing from most true crystals by swelling in water; the globoid is a nearly spherical mineral concretion, consisting mainly of a double phosphate of magnesium and calcium. Seeds rich in aleurone are the castor bean (Ricinus), the Brazil nut (Bertholletia), peas, beans, etc. See PROTEINS.



ALEURONE.

1. A cell from the castor bean, as seen in water, showing roundish aleurone grains imbedded in the protoplasm. In each, one or more crystals, *c*, and usually a globoid, *g*.
2. Isolated aleurone grains of the same, as seen in olive oil.

ALEUTIAN ISLANDS (ȧ-lū'sh*a*n). An archipelago stretching about 800 miles westward from the extremity of the Alaska Peninsula, and forming with the Commander Islands of Siberia a broken barrier between Bering Sea and the Pacific Ocean. They include about 150 different islands, varying in size from rock pinnacles to land masses like Unimak Island, 65 miles long and 25 miles wide, which lies at the eastern end of the chain. The islands lie in a belt 20 to 50 miles wide, between longitude 163° 30′ W. and 172° 22′ E., and latitude 51° and 54° 50′ N. They are mountainous, the highest peaks being Mount Shishaldin (8000 feet) on Unimak Island and Mount Makushin (4000 feet) on Unalaska Island; both active volcanoes. There is no timber on the islands, but they support a luxuriant growth of grass and abundant wild flowers. The soil is fertile, and the growing season long enough to mature any vegetables. Cattle have been successfully raised at Dutch Harbor, and the islands undoubtedly have prospective value for grazing purposes. Caribou were formerly found on Unimak Island, but are now extinct; and the rest of the group contains no land animals larger than the fox. The adjacent waters teem with marine organisms, the largest of which are the sea otter (now nearly extinct), and the hair seal. The cod and halibut fisheries are valuable. The precipitation is from 24 to 48 inches, and the mean annual temperature about 40°. The harbors are open throughout the year. The population (1900) is about 1800, less than 200 being white and about 400 of mixed blood. The largest settlements are Dutch Harbor and Unalaska, both on Unalaska Island. The natives, termed Aleuts by the Russians, are closely related to the Esquimaux. The ravages of the Russian fur-traders from 1754 to 1800 at one time threatened to almost exterminate the native population. The Russians practically enslaved the natives, compelling them to capture sea otters. During the Russian occupation hunting parties of 500 to 1000 men were sent as far north as Sitka. The Aleuts were long supported by the trade in sea otter skins, but now they make a precarious living by fishing and fox trapping. There is a small fur trade in the islands, and Dutch Harbor is used as a coaling station by some of the vessels sailing to Nome. They are mostly converts to the Greek Church, which maintains missions and schools on Unimak and Attu islands. On Unimak there is also a Methodist mission. There is a lighthouse on the western end of Unimak Island, and the Navy Department is constructing a coaling station on Kiska Island, about midway of the chain. Vitus Bering, a Russian fleet captain, discovered the Aleutian Islands in 1741.

ALE'WIFE (either *aloofe*, the Indian name of the fish, or from its resemblance to a corpulent woman who keeps an alehouse). A small clupeoid fish (*Pomolobus pseudoharengus*), 8 to 10 inches long, closely related to the herring and the shad, and resembling the latter in form and color. It is very abundant on the eastern coast of the United States, where it enters Chesapeake Bay and its rivers, the Hudson, and other streams to spawn. Their time of arrival depends upon the temperature, but usually is during the first week of April in the Hudson, somewhat in advance of other fishes. "Their eggs are adhesive, like those of the herring, and stick to the bottom in shoal water, or to anything they may touch, from 60,000 to 100,000 being laid by each female fish at once, almost all of which are devoured by countless enemies before they can hatch." They have also become land-locked in several lakes of western New York. Though inferior to the shad in quality, they are taken in vast quantities (62,000,000 pounds reported in 1896), and are, next to the shad and the salmon, the most important American anadromous food-fish. It is called *gaspereau* by the French-Canadian fishermen, and branch-herring and saw-belly are other local names. In Bermuda the term 'alewife' is applied to the round pompano. See Plate of HERRING AND SHAD.

ALEXANDER THE GREAT (B.C. 356-323). King of Macedonia and conqueror of the Eastern world, son of Philip II. of Macedon and of Olympias, an Epirot princess. At Alexander's birth, his father had already established his position as King of Macedonia, had made great progress in developing his army, and had begun the extension of his kingdom to the eastward, so that he possessed the rich gold mines in Mount Pangæus. The yearly revenue of 1000 talents made feasible his policy of expansion. Though a thoroughgoing Macedonian Philip was still possessed of genuine Greek culture; doubtless, while a hostage at Thebes, he had learned much besides military and political wisdom. He chose Aristotle as his son's tutor. How far the teacher influenced the pupil we cannot determine; he undoubtedly gave him a thorough training in rhetoric and literature—he may have inspired that love for the Hellenic past which characterized Alexander later; but it is improbable that Alexander's far-reaching ambition for conquest gained the sympathy of Aristotle. In the summer of B.C. 336 Philip was assassinated; that the murder was instigated by Olympias, whom Philip had put away in favor of the niece of his general Attalus, there is little doubt; and it is probable that Alexander was implicated in it. Philip had gained a remarkable position for a Greek ruler. He had extended his empire eastward, had made Thrace tributary, and had tried to capture Byzantium. Thessaly was dependent on him; he had gained a place in the Amphictyonic Council; and, by his victory at Chæronea (August, 338), he had made himself the head of all Greece, a position formally recognized by the Congress of States at Corinth in the following year. The greatest legacy, however, which he left his son was the large conception of a Panhellenic empire.

At his accession Alexander found himself surrounded by enemies at home and threatened by dangers abroad. The subject States were planning to revolt, and Greece hated the Macedonian hegemony. But the hands of assassins cleared away his domestic enemies. With the greatest speed he descended to the south; before the summer closed he had reëstablished Macedon's position in lower Greece and had been elected by the Congress at Corinth to his father's place as general against the Persians. The next year he speedily carried out a successful campaign against the defecting Thracians, and penetrated to the Danube. On his return he crushed in a single week the threatening Illyrians, and then hurried into Greece, for certain States had been negotiating with Persia. In September he razed Thebes to the ground, sparing only the house of the poet Pindar. This prompt action ended all positive resistance in Greece and left Alexander free to enter on his eastern campaigns.

At the beginning of 334 he crossed to Asia Minor, where his generals had already gained a foothold. To secure Macedonia and Greece he had been forced to leave behind a considerable portion of his army; only 30,000 foot and 5000 horse followed him, yet these were undoubtedly skilled veterans. His ships numbered but 160, which were so inadequate to combat the 400 galleys of the Persians that he soon disbanded them. After visiting the site of ancient Troy and making offerings there, he advanced in early summer to meet a Persian force at the river Granicus. He was victorious, and then proceeded to the conquest of Asia Minor. The prompt surrender of Sardis gave him the satrapy of Lydia, and Miletus soon fell. Halicarnassus resisted stubbornly for a time; but finally the defenders withdrew after firing the city. At the close of the summer's campaign Alexander marched into Lycia, which yielded at once, and then advanced through Pamphylia and Pisidia to Celænæ and Gordion, where with a stroke of his sword he loosed the famous knot and entitled himself to become the lord of Asia.

Gordion was the mustering point for the year 333. Alexander led his reassembled army first into Cappadocia, where he received the submission of Paphlagonia, and then advanced to the 'Cilician Gates.' By a ruse he caused the hostile force here to retire and entered Tarsus unopposed. All Cilicia was soon secured. Thus in less than two summers the greater part of Asia Minor had been won and the first step taken in the plan of conquest. The next was to advance by way of Syria to the subjugation of Egypt; this accomplished, Alexander could proceed against Babylon and Susa. But the Great King had assembled a vast host to check the invader. Battle was joined in the little plain of Issus, where the enormous numbers of the Orientals could not be employed to advantage. The day was decided by Alexander's attack on that part of the line where Darius was in his war-chariot. The Great King turned and fled, while the Greeks drove all before them. The mother, wife, and children of Darius fell into Alexander's hands, but were treated by him with the respect due royalty. While this victory at Issus opened the way to Syria and Egypt, it was far more valuable to Alexander in the prestige it gave him. Darius humbled himself to write, begging for the return of the royal captives and proposing to make a treaty of alliance. Alexander's reply was a stern command to come to him and offer submission.

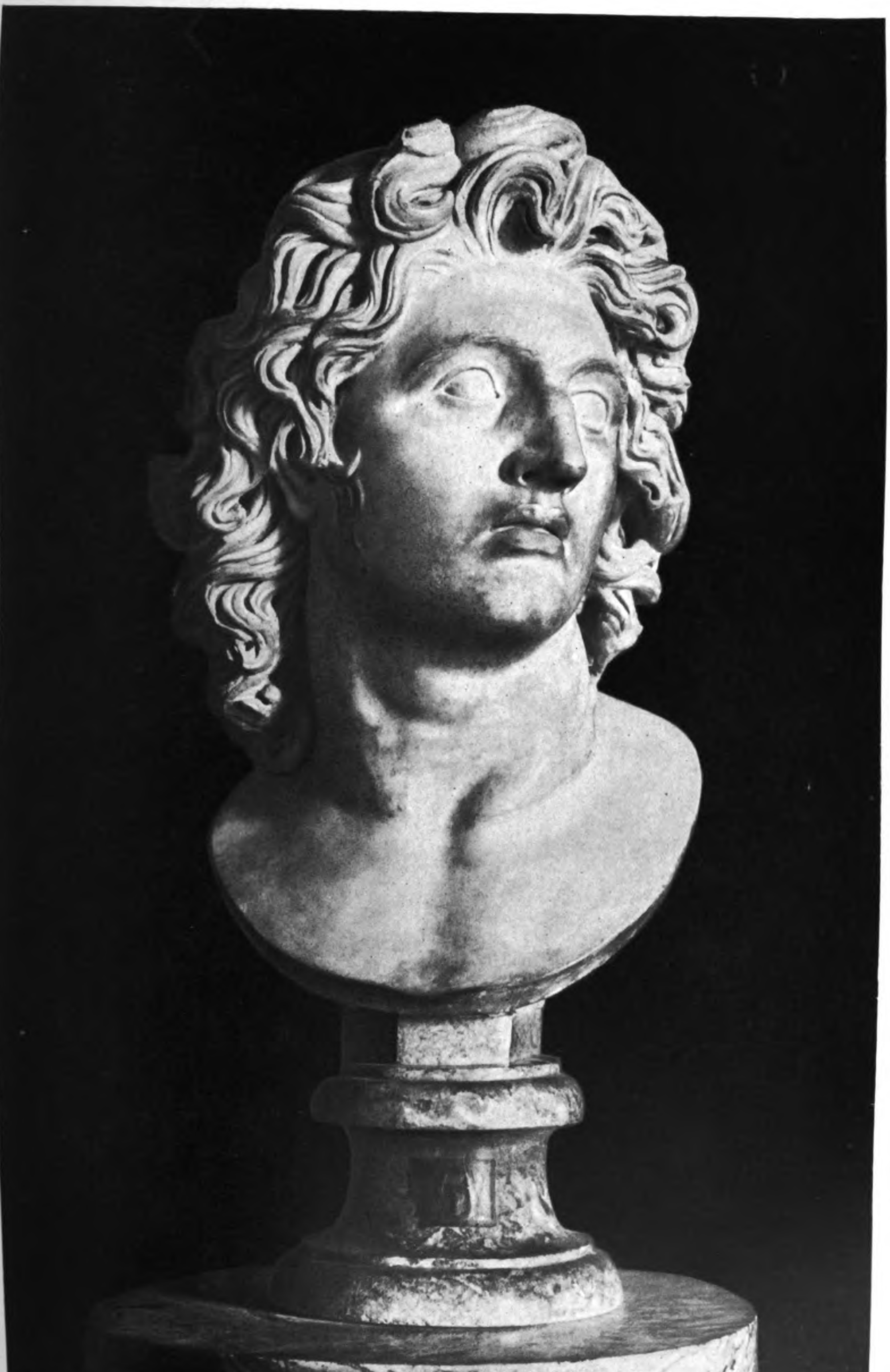
Alexander was not lured aside to pursue and crush Darius, but moved against Syria. Sidon had been reduced by Persia a few years before, so that she welcomed Persia's new foe, who accepted her submission and restored her former territory and rights. The Macedonian army reached Tyre at the end of 333; when this city declined to receive Alexander, it was at once invested. The siege lasted from January to the end of July, 332; again and again the attackers were beaten back, but at last the city fell to a concerted onslaught. Alexander now could advance on Egypt, since Syria was secure. Gaza alone offered stubborn resistance, but succumbed after a siege of some weeks.

About November, 332, Egypt was reached, and the Persian satrap promptly yielded. At Memphis, Alexander was crowned king; he then sailed down the Nile to Canopus and founded a new city bearing his name. This he intended to become the new capital of Egypt and to supplant Tyre as the emporium of trade. History has shown how wisely the site was chosen and the city planned, but the most significant immediate result was the transfer of commerce from the Phœnicians to the Greeks. Presently Cyrene sent Alexander her submission, so that his influence extended to Carthaginian territory. Early in 331 he visited the shrine of Ammon-Rê in the Libyan desert, where tradition says the god acknowledged him as his son, thereby giving him divine title to succeed the Pharaohs.

The following spring Alexander returned to Tyre, where he was occupied with questions of organization. Then he started for Babylon with 40,000 foot and 7000 horse. Early in August he reached the Euphrates, then advanced across Northern Mesopotamia, and marched down the banks of the Tigris. At last he heard that Darius was encamped in a plain near Gangamela with an enormous host, which tradition reports numbered 1,000,000 infantry and 40,000 horse. October 1, 331, the armies engaged. At certain points the Greeks were hard pressed, but at a critical moment Alexander broke the Persian centre, whereupon Darius fled as he had done at Issus; finally the Macedonians won at every point. Darius was pursued to Arbela, where his chariot and weapons were found, but the king escaped on horse to the Median highlands. Babylon opened its gates to the victor, and there the army rested. Susa, with its enormous treasures, soon fell into Alexander's hands.

It was of great importance that Persis and its capital be secured at once, so that although the season was mid-winter Alexander pressed on over the Uxian Pass. He stormed the almost impregnable 'Persian Gates,' and soon was at Persepolis and the royal palaces, whose ruins still give some idea of their magnificence. No less than 120,000 talents were found in the treasuries, together with other spoil. At Pasargadæ also much treasure was taken. About four months, apparently from January to April, 330, were spent at the ancient palace of the Achæmenian kings. During this time the district of Caramania yielded. Then Alexander started in pursuit of Darius, who he had heard was at Ecbatana with an army; but on reaching the city he found that Darius had fled eastward. Alexander soon pressed on, but after great efforts secured only the dead body of his enemy, who had been treacherously slain by his followers. One of the murderers had fled to Hyrcania on the south shore of the Caspian, and Alexander felt it necessary to secure this district before following the other chief assassin into remoter Bactria. The Persians who had retreated into Hyrcania yielded when Alexander appeared, and left him free to advance into northern Areia, where the Persian satrap promptly surrendered. It is not possible here to give in detail the successive steps of Alexander's new advance; by midsummer, 328, he was master of Drangiana, Seistan, Gedrosia, and Arachosia, satrapies corresponding roughly to modern Afghanistan and Baluchistan; he had annexed Bactria and Sogdiana at the north, and had fixed the limits of his conquests in this direction by founding Alexandria Eschate (Khodjend) near the pass over the Tian-shan Mountains. The following year was spent in putting down uprisings and in firmly establishing his power.

Alexander then turned to the conquest of India. He came back to Afghanistan and at Nicæa (Kabul?) prepared for the new campaign. The advance must have been made by the Khyber Pass. The winter of 327-26 was spent in subduing the hill-men and the inhabitants of the river-valleys along the western base of the Himalayas. In the spring he marched to the Hydaspes, receiving the submission of the native princes on the way. At the river he was opposed by King Porus, but by stratagem and skill the Indian monarch was defeated. Alexander gave him back his kingdom much increased, thereby securing a buffer State on his own borders, for apparently he intended the Indus to be the eastern boundary of his empire. He then continued to the southeast until he reached the river Hyphasis. Here the Macedonians refused to go farther, and unwillingly Alexander was obliged to turn back when, as he thought, he was near the end of the world. He returned to the Hydaspes; then advanced southward, subduing the tribes of the lower Punjab, and finally reached the Indian Ocean in the early summer of 325. Part of his force had already been dispatched to reduce a revolt in Arachosia. Alexander himself started in early autumn to return to Babylon across the desert of Mekran, while his fleet was to find a seaway between the East and West. For two months he and his army struggled across the desert, suffering from heat, hunger, and thirst. The losses were very great, so that only a portion of those who started reached the capital of Gedrosia. After a rest, Alexander pressed on to Kirman, where he met his admiral, who in spite of great hardships had made the voyage from India. He was



ALEXANDER THE GREAT

MARBLE BUST IN THE BERLIN MUSEUM

ordered to sail along the Persian Gulf and up the river Pasitigris to Susa, whither Alexander proceeded overland. Upon his arrival his first task was the correction and punishment of misrule on the part of his satraps, many of whom, believing he would never return, had oppressed their provinces and had planned to set up independent kingdoms. When the abuses had been corrected and the guilty punished, Alexander set about the further amalgamation of the Greeks and Orientals. He had already founded Greek cities wherever he had been; he now encouraged intermarriage and set the example himself by taking to wife Statira, the daughter of Darius. He had already married Roxana (q.v.), a Bactrian princess. Many of his officers chose Persian consorts. Furthermore he planned to admit Orientals and Greeks to equality in military service, and established military schools in the various provinces, much against his veterans' wishes.

The greater part of the year 324 was spent in a survey of the Persian Gulf and in general organization at Ectabana. In the winter Alexander returned to Babylon, where embassies from the remotest West came to seek his friendship. But his mind was now busy with plans for building up a great sea trade with India by way of the Red Sea, the Persian Gulf, and the Indian Ocean. Babylon was to become a great seaport. With these things in view he planned a naval expedition to circumnavigate and conquer Arabia. Before this could start, Alexander fell ill of a fever following a carouse, and in twelve days he lay dead (June, 323).

The rapidity and brilliancy of Alexander's military operations have generally obscured his preëminent qualities as a statesman. He inherited from his father the concept of a great empire, and he had the genius to lay the foundations of a unified realm surpassing the dreams of Philip. Throughout the course of his conquest he organized the rule of his satrapies so that the power was divided and revolt made difficult. Seeing that the ruler of the vast realm which he was conquering should adopt much of the native custom, he assumed not a little Oriental state, which undoubtedly strengthened his position in spite of the disapproval it aroused among his Greek followers; and he took many wise measures to amalgamate the East and West. His plans for trade development would have had great effect on social and economic conditions if he could have carried them out. The unified empire which he had created was soon divided among many Macedonian rulers. Yet all the results of his work were not lost. The small Hellenic State had disappeared forever with its narrow exclusiveness, and a more tolerant attitude was maintained by the Greek world after him. The Romans entered into the fruit of his conquests, and the spread of Christianity in the East was made the easier by them.

Consult: Droysen, *Geschichte Alexanders des Grossen* (Gotha, 1898); Grote, *History of Greece* (New York, 1853-56); Holm, *Griechische Geschichte*, iii. (Berlin, 1893); B. I. Wheeler's *Life* (New York, 1900). See Alexander, Legend of.

ALEXANDER. The name of eight Popes. Alexander I., Pope about 109-117.—Alexander II. (Anselm, Bishop of Lucca), Pope 1061-73. He was one of those raised to the papal see by Hildebrand, and showed the latter's zeal in abrogating simony and clerical marriages. He favored William the Conqueror's invasion of England. Through the first part of his reign there was an anti-pope, Honorius II.—Alexander III. (Roland of Siena), Pope 1159-81. He had the active opposition of the Emperor Frederick I., who set up three anti-popes in succession. But he finally overcame all his rivals and the Emperor himself. The tragic history of Thomas à Becket comes in his pontificate, and he forced the unwitting cause of the murder, Henry II. of England, to do penance for the deed and to restore the church property which he had confiscated. His works are in Migne, *Pat. Lat.*, vol. cc. His *Summa* was separately edited by F. Thaner (Innsbruck, 1874). For his life, consult H. F. Reuter (Leipzig, 1860-64).—Alexander IV. (Rinaldo de Conti), Pope 1254-61. He had a controversy with the Emperor Frederick II., and in the last year of his pontificate the Flagellants appeared in Rome.—Alexander V. (Pietro Philargi), Pope 1409-10. He was the choice of the Council of Pisa, and designed to supersede the two rival claimants to the papal succession. But his rivals would not retire, and he dismissed the council, thus really making more trouble. He conferred upon the mendicant monks the right to hear confession.—Alexander VI. (Roderico Lenzuoli Borgia), Pope 1492-1503 (1431-1503). The most celebrated of the eight Popes of this name, and the most notorious prince of his age. He was a native of Valencia in Spain. He was handsome and gallant, and his early life was flagrantly dissolute; but he was made a cardinal at the age of twenty-five by his uncle, Calixtus III., and on the death of Innocent VIII. ascended the papal chair, which he virtually bought. The long absences of the Popes from Italy had weakened their authority and curtailed their revenues, and, as a compensation, Alexander endeavored to break up the power of the Italian princes and appropriate their possessions for the benefit of his own children, Giovanni, Duke of Gandia, Cesare, Duke of Valentinois, and Lucrezia, the Duchess of Ferrara, borne him by a mistress with whom he lived publicly even during his occupation of the papal seat. To gain his end he employed the favorite weapons of the princes of the Renaissance, perjury, poison, and the dagger. Modern research discredits the tradition of his death by poison, and ascribes it to a fever. The most memorable events of his pontificate were the burning of Savonarola (q.v.) the partition of the New World between Portugal and Spain, and the introduction of the *Index Expurgatorius* of prohibited books. Alexander VI. came down to recent times as one of the most nefarious men in history, laden with such vices and crimes as murder, treason, incest, and apostasy. In the nineteenth century, however, serious attempts were made, if not to rehabilitate his character, at least to mitigate the charges brought against him. For the older view in its extremest form, see the *Diarium* of Burchard, master of ceremonies to Alexander VI. (Paris, 1883), and Gordon, *Alexander VI. and His Son* (London, 1729). For a more charitable estimate, see Roscoe's *Life and Pontificate of Leo X.* (London, 1805), and for a well sustained apology, Leonetti, *Papa Alessandro VI.* (Bologna, 1880); Gregorovius, *History of Rome in the Middle Ages* (vols. vi. and vii., Eng. translation, London, 1900), while inclining to the generally accepted opinions, deprives Alexander of the qualities of sagacity and fearlessness which no one else denies him, and depicts him as the weak instrument of his ambitious son, Cesare Borgia. Other biographies are by F. Kaiser (Regensburg, 1878) and Clément (Paris, 1882).—ALEXANDER VII. (Fabio Chigi), Pope 1655-67. He confirmed the condemnation of Jansenism, and had the satisfaction of receiving the Swedish Queen, Christina, the daughter of Gustavus Adolphus, into the Catholic Church. Consult his life, by S. Pallavicini (Prato, 1839).—ALEXANDER VIII. (Pietro Ottoboni), Pope 1689-91. He published the bull "Inter Multiplices" against Gallicanism.

ALEXANDER I. (?-326 B.C.). King of Epirus; son of Neoptolemus and brother of Olympias, the mother of Alexander the Great. He was made King of Epirus by Philip of Macedon, and it was at his marriage with Philip's daughter Cleopatra (B. C. 336) that Philip was assassinated. At the request of the Tarentines, Alexander went to Italy (332), to aid them against the Lucanians and Bruttii, but, after considerable success, was slain by the Lucanians at the battle of Pandosia, in Southern Italy.

ALEXANDER II. (?-c.242 B.C.). King of Epirus, son of Pyrrhus and of Lanassa, daughter of the Sicilian tyrant Agathocles. He succeeded his father in B.C. 272. To avenge the death of Pyrrhus, slain while fighting against Antigonus Gonatus, he seized Macedonia, the latter's kingdom. Soon afterward, however, he was deprived of both Macedonia and his own dominions by Demetrius, son of Antigonus, but recovered Epirus by the aid of the Arcanians (Just. xxvi: 3; xxxviii: 1; and Plut., *Pyrrh.* 9).

ALEXANDER I. (1857-1893). Prince of Bulgaria from 1879 to 1886. He was the second son of Prince Alexander of Hesse by a morganatic marriage with Countess Julia of Hauck. He served in the Russo-Turkish War of 1877-78 on the staff of General Gurko and in the personal suite of the Czar. After the erection of Bulgaria into an autonomous principality, he was elected hereditary prince April 29, 1879, by the Bulgarian Sobranje, at the instance of Russia, and the choice was confirmed by those powers which had participated in 1878 in the Congress of Berlin. The principality was organized under Russian influence, but at once developed political parties. Alexander began his administration with a Conservative ministry, seeking to maintain a good understanding with Russia and to establish an orderly government. He then tried a Nationalist ministry, but in 1881 dismissed it, convoked the Sobranje, and secured special powers, under which he appointed a Conservative ministry, headed by two Russian generals, Kaulbars and Soboleff. The Conservative party was but a small faction, and Alexander now allied himself with the Nationalists, who were enabled to assert themselves more and more against the Russian influence. In 1885 Eastern Rumelia revolted against its governor-general, sought aid from Alexander, who assumed the title of Prince of the Two Bulgarias, and accomplished the union in spite of Russian opposition, securing recognition as governor from the Porte. This brought on a war with Servia, in which Bulgaria triumphed, Prince Alexander conducting his army with courage and skill. In the night of August 20-21, 1886, a conspiracy headed by Zankoff, and inspired by Russian machinations, forced him to sign his abdication, and he was kidnapped and taken into Russian territory. Popular indignation in Bulgaria procured his release, but on September 7 he formally abdicated, believing that it was for the good of the country in view of Russian opposition. He had shown a courage, ability, and loyalty to Bulgaria such as had hardly been expected. He died on his estate at Gratz, in Styria.

Consult: Soboleff, *Der erste Fürst von Bulgarien* (Leipzig, 1886), trans. from Russian; Draudar, *Prince Alexander of Battenberg* (1884); A. Koch, Alexander's chaplain, *Prinz Alexander v. Battenberg* (Darmstadt, 1887).

ALEXANDER I., PAVLOVITCH (1777-1825). Emperor of Russia from 1801 to 1825. He was born December 23 (12 Old Style), 1777, at Saint Petersburg, and was the son of Paul I. and Maria Feodorovna (born Dorothea of Württemberg). The violent and arbitrary reign of Alexander's predecessor produced a conspiracy to force his abdication in favor of his son. The Polish prince, Adam Czartoryski, a friend of Alexander, who gives a circumstantial account of the conspiracy, says that Alexander was privy to the plan of forced abdication, but not to the assassination. The news of the accession of Alexander was received, according to the Russian historian Karamsin, as "a message of redemption." Alexander had been educated under the direction of his grandmother, Catharine II., by eminent instructors, chief among whom was the Swiss Colonel Laharpe, whose ability and liberal views made a strong impression upon the imaginative character of his pupil. His education, however, was still incomplete when broken off by the dismissal of Laharpe, on account of his sympathy with the French Revolution. Alexander received a military training which was equally incomplete. His defective education, his experiences in the courts of his great, but despotic and immoral grandmother and of his half-insane father produced a curious mingling of characteristics and tendencies. Czartoryski speaks of the frank avowal made to him in 1796 by Alexander of his sympathy with republicanism and his belief that hereditary power was unjust and absurd. The tragedy with which his reign began also made its impression.

He began his reign with sweeping reforms. He abolished the barbaric and excessive punishments in use under his predecessors, restrained the brutality of the police, did away with the secret tribunal, pardoned many of his father's victims, and in other ways reformed the laws and procedure. Restrictions upon literature, art, and trade were removed. "I would not place myself above the law, even if I could," Alexander wrote to the Princess Galitzin, "for I do not recognize any legitimate power on earth that does not emanate from the law. . . . The law should be the same for all." He was aided in his work by four intimate friends, young men of liberal views—Count Paul Strogonoff, Prince Victor Kotchubei, Nicholas Novossiltsoff, and Prince Adam Czartoryski. These Alexander called his "committee of public safety." They deliberated the duties and the limitations of the imperial power—a new question in Russia, and not much considered since that time. In 1801 the Senate was made the supreme high court, its ukases to be subject only to the imperial veto. The first move of the Senate in opposition to the Emperor, however, met with a sharp rebuke, and Czartoryski well explains the attitude of Alexander: "The Emperor liked the forms of liberty as we like spectacles. . . . He would have willingly consented that the whole world should be free on condition that the whole world should submit voluntarily to his single will." The Russian Senate, in which the idle nobility were shelved, was not the body with which to experiment in parliamentary government. Alexander and his associates discussed the emancipation of the serfs; but the time seemed hardly ripe for that measure. An imperial ukase of March 3, 1804, attempted to ameliorate their condition.

The real administrative achievement of Alexander was the creation by the ukase of September 8, 1802, of the ministries, eight in number: Interior and Police, Finance, Justice, Public Instruction, Commerce, Foreign Affairs, Marine, and War. This was a marked step toward an orderly government from the semi-Asiatic methods by which the growing Empire had been managed. Each department was in charge of a minister and an adjunct. Progress was made toward a codification of the laws. The privilege hitherto held by the nobles only, that their patrimonial estate should not be confiscated as a punishment, was made the common right of all subjects. An imperial bank was instituted, Odessa was made a free port, the laws regarding debt and mortgages were amended, and by the ukase of 1818 peasants were permitted to carry on manufactures. Alexander sent expeditions around the world, and made treaties with the United States, Spain, Brazil, and Turkey. Settlements were established on the northwestern coast of America, but the enunciation of the Monroe Doctrine in 1823 checked the Russian advance in the last direction. The new Ministry of Public Instruction meant much for the Empire. There had been but three universities in Russia—Moscow, Vilna, and Dorpat. These were strengthened, and three others were founded at St. Petersburg, Kharkov, and Kazan. Literary and scientific bodies were established or encouraged, and the reign became noted for the aid lent to the sciences and arts by the Emperor and the wealthy nobility.

The foreign policy of Alexander was marked, like his internal policy, by plans outrunning performance. He at first stood as an advocate of peace. He endeavored to obtain from Napoleon just compensation for the German States; but, becoming convinced of Napoleon's bad faith, he joined the coalition of 1805. He was the ally of Prussia against Napoleon in the campaign of 1806, carrying on wars at the same time with Persia and Turkey. His forces fought an indecisive battle at Eylau in February, 1807, and were totally defeated at Friedland in the following June. In July, 1807, Alexander signed the Treaty of Tilsit, in which he left Prussia to her fate. Dazzled by the genius of Napoleon and by his scheme for the division of the world into an Eastern and a Western Empire, Alexander joined the Continental System (q.v.), declared war on England (1808), and wrested Finland from Sweden. At Erfurt in the autumn of 1808 the two emperors met with great pomp, but the ill-assorted alliance soon lost force. The pressure of the Continental System on the material resources of Russia, the growth of the Napoleonic despotism, the existence and aggrandizement of the Duchy of Warsaw, were utterly opposed to Alexander's theories and to his sense of sound Russian policy. At length in 1812 a rupture ensued, and Napoleon's Grand Army entered Russia, only to be destroyed in the retreat from Moscow. Alexander threw himself into the struggle of Europe against the French Emperor, and raised an army of nearly 900,000 men. He took part personally in the campaigns, and was prominent in the negotiations at Vienna.

At Paris, in 1814, Alexander, who by nature had always been inclined toward religious mysticism, fell under the influence of Madame Krüdener (q.v.). It was under this influence that he instituted the Holy Alliance (q.v.), the declared object of which was to make the principles of Christianity recognized in the political arrangements of the world, but which became through Metternich a mere means for the reëstablishment of political absolutism. The latter part of Alexander's reign presents a strong contrast to the earlier. The ardent young reformer was drawn into a reactionary course. He concurred in the Austrian policy of Metternich, and by repressing insurrection in Europe assisted in crushing the political progress of the nations. The spread of education ond liberal ideas, and the disorder of the finances, due to Russia's active part in the Napoleonic wars, aroused popular discontent, which was put down by the censorship and police espionage. Alexander became morbid and embittered, and sought relief alternately in dissipation and in religious mysticism. Personal exposure during the inundation of St. Petersburg in 1824 undermined his health; the death of a favorite daughter and the discovery of a Russo-Polish conspiracy against the House of Romanoff aggravated his illness. With the Empress he sought rest in the Crimea, but was seized by an illness on the journey, and died at Taganrog, December 1 (November 19, Old Style), 1825.

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ALEXANDER II., NIKOLAYEVITCH (1818-81). Emperor of Russia from 1855 to 1881, son of Nicholas I. He was born April 29, 1818, and received a thorough education and military training. He traveled in Germany, and in 1841 married Princess Maria of Hesse-Darmstadt. He also journeyed through Russia, Siberia, and the Caucasus, and took a creditable part in the campaigns against the Tcherkesses. On succeeding to the throne during the Crimean War (March 2, 1855), he assured the foreign ambassadors that he would adhere to the policy of his uncle (Alexander I.) and his father, but his desire was for an honorable peace. In March, 1856, he was compelled to sign the humiliating Treaty of Paris. Alexander had not been in sympathy with the reactionary course of his father. While not a liberal, or an idealist like the first Alexander, he represented the intelligent thought of Russia, and believed that a transformation was needed to place it in the first rank among nations. He soon announced his intention to promote reforms, and he was encouraged in this by the shock which the Crimean War had given to the old corrupt officialism of the Empire. Two reform parties arose, one a liberal constitutional party, having its centre at St. Petersburg, the other an old Russian nationalist party, centring at Moscow. They were united only in enmity to the bureaucracy. In response to their wishes and his own convictions, Alexander relaxed the censorship of the press, permitted travel, exercised a close control over officials, recalled many who had been exiled to Siberia during the previous reign, extended education, and without instituting radical changes in the machinery of the government greatly widened the liberty of his subjects.

The greatest of his administrative achievements was the emancipation of the serfs. With this, of necessity, went a reform in the system of land tenure. Nearly all of Russia was held in large estates, worked by serfs who were nominally attached to the land, but were in fact almost as much at the disposal of their masters as if they had been slaves. Nine-tenths of the arable land of Russia was thus held by the imperial family and about 100,000 noble families. Naturally, the landed nobility obstructed the Czar's reform; but he pressed his point in one province after another, and had a plan for emancipation prepared. Beginning in 1858 by freeing the serfs on the estates of the imperial family, the Czar completed the emancipation by the ukase of March 3 (February 19 Old Style), 1861. Serfs who had been domestic servants, not attached to the land, became free without right to property. Those who had been attached to the land were enabled by a State loan, payable six per cent. annually for forty-nine years, to purchase the interest of the former landlords in a certain share of the land. The freedmen thus became peasant proprietors, the land being held by the *mirs*, or village communities, which could assign it to the members. Police authority was put in the hands of the communal assemblies, and larger powers of taxation, administration, and police were vested in district and provincial councils. If the economic results of this arrangement have been slow in development, and not altogether satisfactory, the social transformation effected by the emancipation of 23,000,000 people was great and immediate. In carrying out his plan, Alexander was assisted by Nicholas Miliutin. The Emperor also established a regular system of courts. Public schools were founded after the model of Western Europe, and scientific schools were erected in addition to those devoted to the regular classical training. The army, which in the Crimean War had so disappointed Nicholas I., was reorganized on the Prussian plan. While Alexander went thus far with the liberals, the Pan-Slavism of the Nationalists found equal sympathy with him. He said to the Polish deputies: "Embrace the union with Russia and abandon all thoughts of independence, now and for evermore impossible. All that my father did was rightly done. My reign shall be a continuation of his." The Polish national movement, culminating in the insurrection of 1863, was severely repressed, and a relentless process of Russification was instituted under Michael Muravieff. Since that time Poland has been under what is practically martial law. After 1863 there was a gradual return to absolutism in Russia, and many of the liberties that had been granted were withdrawn or modified, the Czar falling more under the influence of the conservative Nationalist party, led by Katkoff, the Moscow editor. For a few years the liberals contented themselves with criticism of the conservative position and legal attempts to restore their influence. Then began the revolutionary movement, which finally developed in the hands of a few violent spirits into terrorism after 1875. (See NIHILISM.) The socialism of Marx and Proudhon had by this time been brought in from Western Europe.

Between 1868 and 1881, the armies of Alexander were advancing the Russian frontiers in Central Asia. In 1868 Samarkand was occupied; in 1873 the Khan of Khiva was reduced to vassalage; in 1876 Khokand was annexed; and in 1881, just before the assassination of the Emperor, Geok-Tepe, the stronghold of the Teke Turkomans, was taken. The vigorous policy adopted after 1870 brought on a war with Turkey in 1877-78, in which the Russian standards were carried almost to Constantinople. This war appealed to the chivalric spirit of Alexander, who wished to be known as the Liberator Czar, because it was in a sense a crusade in behalf of the oppressed Christian peoples of the Balkans. The hopes of a Russian hegemony in the Balkan Peninsula, entertained by the Pan-Slavists, were overthrown, however, at the Congress of Berlin (q.v.).

The existence of the liberal and reactionary parties side by side in Russia explains some of the inconsistencies in Alexander's character. It is because of these opposing influences, both patriotic, that progressive and oppressive measures were often simultaneously enacted. Personally, Alexander seems to have tended always to the liberal side, although somewhat embittered by the spread of the revolutionary agitation. His life, during the years 1879-81, was never safe from the conspiracies of the extreme revolutionists, who pursued him with a remarkable persistence of hatred. After the terrible explosion of 1880, in the Winter Palace, Alexander gave General Loris-Melikoff, a distinguished officer of liberal tendencies, an extraordinary dictatorial commission for six months, and it is said that under Loris-Melikoff's advice, he was considering the question of the promulgation of a constitution by ukase when he was assassinated in Saint Petersburg by the explosion of a bomb while driving from the parade to the Winter Palace on Sunday, March 13, 1881. He was succeeded by his son, Alexander III.

Consult: Haumant, in Lavisse et Rambaud, *Histoire générale*, vol. xi. (Paris, 1900); Cardonne, *L'empereur Alexandre II.* (Paris, 1883); Golovin, *Russland unter Alexander II.* (Leipzig, 1870); Laferté (pseudonym of the Princess Dolgorouki), *Alexandre II., Détails inédits sur sa vie intime et sa mort* (Basel, 1882).

ALEXANDER III., ALEXANDROVITCH (1845-94). Emperor of Russia from 1881 to 1894. He was born March 10, 1845, and he succeeded his father, March 13, 1881, but was not crowned until May 27, 1883, after the panic caused by the assassination of Alexander II. had somewhat subsided. Alexander at first expressed his intention of following out the constitutional reforms of Loris Melikoff, but he fell under the influence of the leaders of the old Russian Nationalist party, Katkoff, Pobiedonostseff, and Ignatieff, and restored the autocratic system of Nicholas so far as internal affairs were concerned. He pursued a stern policy of repression with regard to the political agitation which had caused the violent death of his father. The Terrorists were practically suppressed, a rigid censorship was reëstablished, education was restricted, and dissenting religions were persecuted. Among the sects that were persecuted were the Jews; and as a result of the persecution great numbers of them emigrated from the country, chiefly to the United States and South Africa. The policy of the Russification of the non-Russian provinces, begun by Nicholas I. and discontinued for a time by Alexander II., was resumed with new vigor. The finances of the Empire were well managed. The revenue was largely increased, and a protective tariff was used as a part of the system to strengthen Russian nationality.

In his foreign policy Alexander did not follow the example of Nicholas. His influence was directed toward the preservation of peace. Russia and France were drawn into closer and closer connection in opposition to the Triple Alliance of Germany, Austria, and Italy. Alexander continued the policy of interference in the affairs of the Balkan States, especially Bulgaria, bitterly resenting that spirit of nationalism which his father had regarded as ingratitude toward Russia. He endeavored, not very successfully, to counteract Austrian influence among the Balkan peoples. In Asia he continued to round out the frontier and strengthen Russia's hold on its provinces. Several attempts were made to assassinate him, but they lacked the completeness of preparation and the venomous persistence which had pursued his father. Alexander married Dagmar (re-baptized into the Greek Church as Maria Feodorovna), daughter of Christian IX. of Denmark, November 9, 1863. He died November 1, 1894. He was succeeded by his son, Nicholas II.

Consult: Andrews, *Historical Development of Modern Europe*, Volume II. (New York, 1898); Seignobos, *Political History of Modern Europe* (New York, 1900); Samson-Himmelstierna, *Russland unter Alexander III. mit Rückblicken auf die jüngste Vergangenheit* (Leipzig, 1891), translated by Morrison, *Russia under Alexander III. and in the Preceding Period* (New York, 1893); Lowe, C., *Alexander III. of Russia* (London, 1895). This reign has claimed very little special attention from historians.

ALEXANDER I. (c. 1078-1124). King of Scotland, the fourth son of Malcolm Canmore. He succeeded his brother Edgar, in 1107, but he ruled over only the old kingdom of Scotland, north of the Forth and Clyde, Cumbria having been made practically an independent principality by Edgar on his deathbed. Alexander was called "the Fierce," as a result of his campaign against some northern clans who had rebelled because of their aversion to the introduction of English customs. Alexander was naturally inclined to follow English ways, for his mother was Margaret, grandniece of Edward the Confessor, his wife a natural daughter of Henry I. of England, and he himself had been educated in England. During his reign there was peace between England and Scotland. Yet he worked earnestly for the independence of Scotland, and especially to free the Scottish Church from its subjection to either York or Canterbury. He bestowed great gifts on the Church, and founded several monasteries, including the abbeys of Scone and Inchcolm. He died April 27, 1124, and was succeeded by his brother David.

ALEXANDER II. (1198-1249). King of Scotland. He succeeded his father, William the Lion, in 1214. He early displayed that wisdom and strength of character by which he won the appellation of "the Peaceful," and in virtue of which he holds so high a place in history among Scottish kings. In 1214 he joined the English barons who had combined to resist the tyranny of King John, and who secured the Magna Charta. This drew down upon him and his kingdom the papal excommunication; but subsequently the ban was removed, and the liberties of the Scottish Church were confirmed. On the accession of Henry III. to the English throne, Alexander brought the feuds of the two nations to a temporary close by a treaty of peace (1217), and, in 1221, he married Henry's eldest sister, the Princess Joan. The alliance thus established was broken after the death, without issue, of Queen Joan (1238), and the second marriage of Alexander with the daughter of a nobleman of France. In 1244 Henry marched against Scotland to compel Alexander's homage, but peace was concluded without an appeal to arms. While engaged in one of those warlike expeditions which the turbulence of his subjects so frequently rendered necessary, Alexander died of fever at Kerrera, a small island in the Bay of Oban.

ALEXANDER III. (1241-85). King of Scotland. He succeeded his father, Alexander II., in 1249, and two years afterward he married the Princess Margaret, eldest daughter of Henry III. of England. Alexander's minority enabled Henry to prosecute successfully for some time his schemes for obtaining entire control over the Scottish kingdom; but long before he reached manhood, Alexander displayed so much energy and wisdom as to give assurance that when the administration of affairs should come under his personal direction it would be vain to think of reducing him to submission. Very shortly after he had come of age his energies were summoned to the defense of his kingdom against the formidable invasion of Hakon, King of Norway (1263), who claimed the sovereignty of the Western Isles. In attempting a landing at Largs, on the coast of Ayr, the Norwegian prince sustained a total defeat, and Alexander, as the result of this important victory, secured the allegiance both of the Hebrides and of the Isle of Man. An alliance was formed between Scotland and Norway, and strengthened in 1281 by the marriage of Alexander's only daughter, Margaret, to Eric, King of Norway. This princess died in 1283, leaving an infant daughter, Margaret, commonly called the Maiden of Norway, whose untimely death, on her way to take possession of her throne, was the occasion of so many calamities to Scotland. During the concluding years of Alexander's reign the kingdom enjoyed a peace and prosperity which it did not taste again for many generations. The justice, liberality, and wisdom of the King endeared his memory to his subjects, while the misfortunes that followed his death heightened the national sense of his loss. His eldest son, Alexander, who had married the daughter of the Count of Flanders, died without issue in 1283. Alexander contracted a second marriage in 1284 with Joleta, daughter of the Count of Dreux. He was killed by falling from a precipice in 1285.

ALEXANDER I. (1876-1903). King of Servia. The son of King Milan and Queen Natalie. On the abdication of Milan, in 1889, he was proclaimed King, under a regency. In 1893 he assumed personal control of affairs, and in 1895 promulgated a new constitution. In July, 1900, he married Madame Draga Mashin, a widow much older than himself. He and his consort were assassinated, June 11, 1903. See Servia.

ALEXANDER, Abraham (1718-86). An American legislator. He was born in North Carolina, and in early life was a magistrate of Mecklenburg County, which he represented in the Colonial Legislature until 1775. In this year he served as chairman of the county convention, which, on May 31, passed a series of resolutions, later distorted into the famous "Mecklenburg Declaration of Independence" (q.v.).

ALEXANDER, Archibald (1772-1851). An American Presbyterian clergyman. He was born in Augusta (now Rockbridge) County, Va. He was self-educated, and was led to religious study in the revival of 1789. He was licensed to preach in 1791, and spent several years as an itinerant missionary, and was president of Hampden-Sidney College, 1796-1801. In 1802 he married the daughter of Rev. Dr. Waddell, the blind preacher whose eloquence was eulogized by William Wirt. He was pastor of Pine Street Presbyterian Church, Philadelphia, from 1807 to 1812, and was at the organization of the theological seminary of the Presbyterian Church at Princeton, N. J. He was unanimously chosen professor of theology, the position which he maintained with eminent success until his death there, October 22, 1851. His best-known work is *A Brief Outline of the Evidences of the Christian Religion* (Princeton, 1823), which has been translated into many languages and is a text-book in colleges. He wrote also *The Canon of the Old and New Testaments Ascertained* (1826); *The Log College* (1845), and *Moral Science*, which was published after his death (1852). Consult, for his life, J. W. Alexander (New York, 1854).

ALEXANDER, Barton Stone (1819-78). An American soldier. He was born in Kentucky. He graduated at West Point and entered the engineer corps in 1842. He was engaged in engineering work from 1842 to 1859, superintending the construction of the military asylum at Washington, the marine hospital at Chelsea, Mass., and the Minot Ledge lighthouse, and in 1860 was employed in the construction of defenses around Washington. Subsequently he served with gallantry in the Manassas campaign and in the battle of Bull Run, was consulting engineer on the staff of General Sheridan (1864), and in March, 1865, was brevetted brigadier-general. In 1865-67, he was in charge of public works in Maine. He became senior engineer, with the rank of lientenant-colonel, in 1867, and he was a member of the Pacific board of engineers for fortifications from that time until his death.

ALEXANDER, Edward Porter (1835—). An American soldier and engineer. He was born at Washington, Ga., and graduated at the West Point Military Academy in 1857. After serving as an engineer in the United States Army, he joined the Confederacy in 1861, and advanced to the rank of chief of ordnance and chief signal officer in the Army of Northern Virginia (1861-62). In February, 1864, he was commissioned brigadier-general. He was also chief of artillery in General Longstreet's corps, and served in that capacity in the battles of the Wilderness and Spottsylvania, and at the siege of Petersburg. At the close of the war he was appointed professor of mathematics and engineering at the University of South Carolina, and four years afterward began his career as general manager and president of various Southern railroads. He was a government director of the Union Pacific Railroad from 1885 to 1887, and in 1901, as engineer arbitrator, took charge of the boundary survey between Costa Rica and Nicaragua.

ALEXANDER, Francis. An early American portrait painter (1800-81). He was born in Windham Co., Conn., and studied with Alexander Robertson in New York, and Gilbert Stuart at Boston, in which city he practised as a portrait painter. After having studied in Italy from 1831 to 1833 he returned to Boston. He was of a very enterprising character, and it is related that when Dickens visited American in 1842, he appeared with the pilot who had come to guide the ship into the harbor, and induced the novelist to sit to him for a portrait. His best known portrait is that of Mrs. Fletcher Webster in the Boston Museum. His art resembles that of the painters of the middle period of American painting, being classic in line and glossy in color.

ALEXANDER, George (1858—). An English actor and manager, whose full name is George Alexander Gibb Samson. He was born at Reading, June 19, 1858, and was educated at Clifton, Stirling, and Edinburgh. In 1881 he joined Irving's company at the Lyceum, where later he won particular successes as Faust (1886) and Macduff (1888). In the season of 1884-85 he accompanied Mr. Irving to America. Mr. Alexander began management in 1890 at the Avenue Theatre, but took the St. James Theatre in the next year. He presented *The Idler* (1891), *Lady Windermere's Fan* (1892), *The Second Mrs. Tanqueray* (1893), *The Prisoner of Zenda* (1896), *In Days of Old* (1899), and Stephen Phillips's *Paolo and Francesca* (1901), besides several successful Shakespearean productions, including *As You Like It* (1896), and *Much Ado About Nothing* (1898).

ALEXANDER, James (1690-1756). A colonial lawyer. He was born in Scotland, emigrated to New Jersey in 1715, practised law, and was temporarily disbarred for defending John Peter Zenger (q.v.), when he was accused of sedition in 1733. He held many responsible public offices, and was one of the founders of the American Philosophical Society. He was the father of William Alexander (q.v.).

ALEXANDER, Sir James Edward (1803-85). A Scotch officer, traveler, and author. He served in the war against Burma (1825), and in various other campaigns. He traveled in Persia and South America, and in 1836-37 conducted an exploring expedition into Africa. He was appointed general in 1882. His works include:

Travels Through Russia and the Crimea (1830), *Transatlantic Sketches* (1833), *Expedition of Discovery into the Interior of Africa* (1838), *L'Acadie* (1849), *Incidents of the Last Maori War* (1863), *and Bushfighting* (1873).

ALEXANDER, James Waddell (1804-59). An American clergyman, a son of Dr. Archibald Alexander. He graduated at Princeton College in 1820 and afterward was a tutor there. He was installed pastor of the Presbyterian church at Charlotte Court House, Va., in 1827, and of the First Church of Trenton, N. J., in 1829. He was professor of Belles Lettres and Latin in Princeton College, 1833 to 1844, pastor of the Duane Street Church, New York, 1844 to 1849, and professor of ecclesiastical history, Church government, and sacred rhetoric in Princeton Seminary, 1849-51. When the Duane Street Church in New York was reorganized as the Fifth Avenue Church, he again became its pastor and continued to be until his death. Among his many works are volumes of sermons: *Plain Words to a Young Communicant* (1854), *The American Mechanic and Workingman* (1847, 2 volumes), and a biography of his father (1854).

ALEXANDER, John Henry (1812-67). An American scientist, born at Annapolis, Md., and educated at St. Johns College there. He was connected with the Maryland geological survey, and did much toward opening the coal fields of that State. He published, in 1840, a *History of the Metallurgy of Iron.* He was active in establishing a uniform standard of weights and measures throughout the United States, and published a *Universal Dictionary of Weights and Measures* (1850). He was professor of physics for two years in St. James College, Md., and held a similar position at the University of Pennsylvania. Consult: Hilgard, *Biographical Memoir of John H. Alexander* (Washington, 1877); National Academy of Sciences, *Biographical Memoirs* Volume I. (Washington, 1866).

ALEXANDER, John White. (1856—). An American portrait and figure painter born in Allegheny City, Pa. He was a pupil at the Royal Academy in Munich, and also studied under Frank Duveneck, with whom he went to Italy. His works include the portrait of Walt Whitman (Metropolitan Museum, New York), "The Pot of Basil" (Boston Museum), "In the Café" (Philadelphia Academy), "La Femme Rose" (Carnegie Gallery, Pittsburg), "The Green Bow" (Luxembourg, Paris), and six large mural decorations in the Congressional Library, Washington. Later works are 'Autumn,' the "Glass Bowl," "A Rose," and portraits of Rodin (Cincinnati Museum), Mrs. Clarence Mackay, and his mother. He was awarded gold medals at the Paris Exposition (1900) and the World's Fair at St. Louis (1903). The most important exhibition of his works was held at the Pratt Institute, Brooklyn, in 1905. It is the decorative quality in his works which first arrests attention. Each painting represents a distinct color scheme. In his portraits he paints only essentials.

ALEXANDER, Joseph Addison (1809-60). Eminent American biblical scholar; born in Philadelphia; a son of Dr. Archibald Alexander. He was a pupil of his father, graduated at Princeton College in 1826, was adjunct professor there of ancient languages and literature from 1830 to 1833, instructor, associate professor, and professor of Oriental and biblical literature in Princeton Seminary from 1833 to 1850; of Church history and government from 1851 to 1860, of New Testament literature and biblical Greek in 1859 and 1860. He wrote commentaries on *The Psalms* (1850, 3 volumes); *Isaiah* (1846-47, 2 volumes); *Matthew* (1860); *Mark* (1858); *Acts* (1856); all drawn largely from German sources. He also published *Sermons* (1860, 2 volumes). Consult his *Life* by H. C. Alexander (New York, 1869, 2 volumes).

ALEXANDER, Legend of. A famous but largely fictitious account of the adventures of Alexander the Great, which was the basis of many romantic works in the Middle Ages. It originated probably at Alexandria, in Egypt. The historical narrative of Callisthenes (q.v.) having been lost, there appeared about 200 A.D. under his name (sometimes referred to as the pseudo-Callisthenes) a Greek story, which represented Alexander as really the son of Nectanebus, the last king of Egypt, and credited him with a fabulous series of exploits in connection with his actual conquests. This was translated into Latin early in the fourth century by Julius Valerius. His version was subsequently abridged, particularly in the account called *Historia de Prœliis,* by Archbishop Leo, about the end of the tenth century. About the twelfth century, the period of the *Chansons de geste* of the cycle of Charlemagne, several French poems were built upon the Alexander Legend; the earliest was that of Alberic of Besançon, of which only the beginning is extant; the best known is the great *Chanson d'Alexandre,* by Lambert li Cors and Alexandre de Bernay. The twelve-syllable lines in which this was written gave its name to the Alexandrine verse. The Alexander of the Middle Ages was essentially a mediæval knight. He became one of the "nine worthies," and one of the four 'kings' in the game of cards. More or less original versions of the legend appear in poems of nearly every European country, and even in the Orient, where the story of the pseudo-Callisthenes was rendered into Syrian and Armenian as early as the fifth century. Some of the Slavic forms of the tale go back through Byzantium to this Eastern version. Of those in Western Europe, most notable after the French poems are perhaps those in German by Lamprecht, who translated that of Alberic, and by Rudolph of Hohenems, of the thirteenth century. An old English version of Julius Valerius is the poem called *King Alisaunder.* Consult: Paul Meyer, *Alexandre le Grand, histoire de la légende d'Alexandre dans les pays romains* (Paris, 1886); Spiegel, *Die Alexandersage bei den Orientalen* (Leipzig, 1851).

ALEXANDER, Mrs. See Hector, Annie.

ALEXANDER, Samuel (1859—). An English philosopher and educator, born at Sydney, N. S. W. He was educated at the University of Melbourne and at Oxford; and was Fellow of Lincoln College from 1882 to 1893. In 1893 he was appointed to the chair of philosophy in Owens College (Victoria University). In addition to frequent important contributions to the *International Journal of Ethics,* to *Mind,* and other technical periodicals, he has written *Moral Order and Progress* (London, 1889).

ALEXANDER, Stephen (1806-83). An American astronomer. He was born at Schenectady, N. Y., and was educated at Union College and Princeton Theological Seminary. He remained at Princeton, becoming adjunct professor of mathematics (1834-45), professor of mathematics (1845-54), and professor of astronomy from 1840 until his retirement in 1878 as professor emeritus. During a part of this time he was professor of natural philosophy. In 1860 he was at the head of the expedition to Labrador to observe the solar eclipse of July 18. He was the author of many scientific papers, chiefly astronomical, such as *Physical Phenomena Attendant Upon Solar Eclipses* (1843), *Origin of the Forms and Present Condition of Some of the Clusters of Stars* (1850), and *Harmonies in the Arrangement of the Solar System.* He also wrote on the *Fundamental Principles of Mathematics.*

ALEXANDER, Sir William, Earl of Stirling (c. 1568-1640). A Scottish poet and statesman; born probably at Menstrie. He was educated at Glasgow University, traveled on the Continent, was tutor to the young Earl of Argyle, and so found access to the court of James I. He wrote sonnets, the *Four Monarchick Tragedies, Elegy on the Death of Prince Henry, Doomsday,* and many minor poems. In 1621 he received the largest gift ever bestowed on a subject, viz., a "gift and grant" of Canada, including Nova Scotia and Newfoundland; a striking expression of royal ignorance of geographical limits in America. Charles I. confirmed the grant. Alexander was made Secretary of State for Scotland in 1626, and in 1630 was created a peer as Lord Alexander of Tullibody and Viscount Stirling, and was made judge of the Sessions in 1631. The next year he built the Argyle House, still one of the sights of Stirling. In 1633 he was made Earl of Stirling and Viscount of Canada, and in 1639 Earl of Dovan. Consult *Poetical Works,* with memoir (Glasgow, 1870-73).

ALEXANDER, William (1726-83). An American soldier, generally called "Lord Stirling." He was born in New York City and was the son of James Alexander (1690-1756), a colonial lawyer and attorney-general of New York (1721-23) who took an active part in the defense of Zenger (q.v.), and was prominent on the side of the colonists in the early disputes with the British ministry. He served in the French and Indian War, first as commissary and then as aide-de-camp to General Shirley: but went to England in 1756 to defend Shirley against the charge of neglect of duty (see Shirley, William), and to urge his claim before the House of Lords to the earldom of Stirling, through descent from Sir William Alexander, Earl of Stirling (1580-1640). This claim was not allowed, and in 1761 he returned to America. He soon became surveyor-general and a member of the Provincial Council, and in November, 1775, enlisted as colonel in a New Jersey regiment. In January, 1776, he was promoted to the rank of brigadier-general, and on August 27 took a conspicuous part in the battle of Long Island (q.v.), where his brigade was almost annihilated and he himself was captured. He was exchanged within a month, became a major-general in February, 1777, served with great gallantry and efficiency in the battles of Brandywine, Germantown, and Monmouth, and subsequently was in command at Albany, N. Y., until his death. He was well educated, was an enthusiastic student of mathematics and astronomy, and was one of the founders and first governor of King's College (now Columbia University). He published a pamphlet entitled *The Conduct of Major-General Shirley, Briefly Stated* (1756), and *An Account of the Comet of June and July* (1770). Consult: W. A. Duer, *Life of William Alexander, Earl of Stirling,* in the collection of the New Jersey Historical Society for 1847, and Charles Rogers, *The House of Alexander* (1877).

ALEXANDER, William (1824—). Archbishop of Armagh and primate of all Ireland. He was born at Londonderry and was educated at Tunbridge School and at Exeter and Brasenose Colleges, Oxford. After entering holy orders he first served a curacy in the north of Ireland, and later became chaplain to the Marquis of Abercorn, Lord Lieutenant of Ireland. He then successively occupied the positions of Dean of Emly (1863) and Bishop of Derry and Raphoe (1867). In 1896 he was enthroned as Archbishop of Armagh. The Bishop, who has been select preacher before the Universities of Oxford (1870-72 and 1882), Cambridge (1872 and 1892) and Dublin (1879), is the author of the following important works: *Witness of the Psalms to Christ* (Bampton Lectures, 1874, third edition), *Verbum Crucis* (fifth edition), *Discourses on Epistles of St. John* (sixth edition), *Commentaries on Epistles to Colossians, Thessalonians, Philemon* (Speakers' Commentaries, Volumes IV., V.).

ALEXANDER, William Lindsay (1808-84). A Scotch divine, born in Edinburgh. He was educated at Edinburgh and St. Andrews, became pastor in Edinburgh, 1835, and professor of theology in the Congregational Theological Hall in that city, 1854. He was a member of the Old Testament Company of the Bible Revision Committee. His publications embrace, *The Connection and Harmony of the Old and New Testaments* (London, 1841; second edition, 1853); *The Ancient British Church* (1852; edited by S. G. Green, 1891); *Christ and Christianity* (1854); *Life of Ralph Wardlaw, D.D.* (Edinburgh, 1856); *Labor and Adventure in Northern Europe and Russia* (edited by J. Paterson, D.D., London, 1858); *A Commentary on Deuteronomy* (1881), and one on *Zechariah* (1885), edited with a life; Charles Ferme's *Analysis on Romans* and A. Melville's *Commentary on Romans,* both translated from Latin (Edinburgh, 1860); and the third edition of Kitto's *Biblical Encyclopædia* (1862-66, 3 volumes), translated, Haevernick's *Introduction* (1852), and part of Dorner's *Person of Christ* (1861). For his biography, consult J. Ross (Edinburgh, 1886).

ALEXANDER ÆTO′LUS (Gk. 'Αλέξανδρος ὁ Αἰτωλος, *Alexandros ho Aitōlos*). A Greek poet of the third century B.C. He was born in Ætolia, but lived mainly at Alexandria, where he was considered one of the seven poets of the Alexandrian tragic pleiad. He also wrote short epics, elegies, and epigrams, of which fragments have been preserved. These fragments, published in Bergk's *Poetæ Lyrici,* attest the cultivated taste of the writer, and prove him one of the immediate predecessors of Callimachus. See Couat's *La poésie alexandrine* (1882).

ALEXANDER ARCHIPELAGO. A group of over 1100 islands and islets off the west coast of Alaska, United States, in lat. 54° 40′ to 58° 25′ N. The largest are Chichagof, Baranof, Kupreanof, Kuiu, Admiralty, and Prince of Wales. The town of Sitka is on Baranof Island.

ALEXANDER BA′LAS. A man of lowly origin whose private name was Balas or Baal, and who possessed a striking resemblance to Antiochus V., Eupator, and was therefore presented by Attalus of Pergamus as a son of Antiochus IV., Epiphanes, and a claimant to the Seleucid throne. He was successful against Demetrius Soter, and reigned as King of Syria from 154 to 145 B.C. His first official act was to appoint Jonathan the Hasmonæan as high priest, an office which the latter publicly assumed at the Feast of Tabernacles, 153 B.C. In 150 B.C. Alexander married Cleopatra, daughter of Ptolemy VII., Philometor, and on that occasion conferred on Jonathan the titles of military and civil governor. In 147 B.C. Apollonius, Governor of Cœle-Syria, took up arms for Demetrius II., but was defeated by Jonathan at Ashdod. The Hasmonæans had every reason to be pleased with Alexander Balas. But he was an incapable and corrupt ruler and hated by his soldiers, who deserted him in 145 B.C. He fled to Abbæ, in Arabia, and was there assassinated.

ALEXANDER COL′UMN (Russ. *Aleksandrovskaya Kolonna*). A monument to Alexander I. of Russia. See ST. PETERSBURG.

ALEXANDER FALLS. See HAY RIVER.

ALEXANDER JANNÆ′US (Lat. form of Heb. *Yannai*, Jonathan) (?-78 B.C.). King of the Jews from 104 to 78 B.C. He was warlike and energetic, and during his reign extended the frontiers of the kingdom toward the west and the south. Defeated by Ptolemy Lathyrus in Galilee, he formed an alliance with Cleopatra of Egypt, and drove the invader from the country. Wars with the Moabites, the Ammonites, and the Arabians engaged his attention till the day of his death. Internally his reign was marked by bitter conflicts between the Sadducees, of which party the King was the head, and the Pharisees, who comprised the vast mass of the people. It is estimated that 50,000 people perished in the civil strife. In putting down a revolt at Jerusalem he slaughtered 6000 of the insurgents, and in the year 86, returning triumphantly from exile, where he had been driven by the Pharisees, he caused 800 rebels to be crucified in his presence and their wives and children to be butchered before their eyes. Consult: Josephus, *Antiquities of the Jews,* Book xiii. chaps. 12-15; and *Jewish War*, Book i. c. 4.

ALEXANDER JOHN I. (1820-73). Prince of Rumania from 1859 to 1866. He was a Moldavian boyar, by name John Cuza, who, when Moldavia and Wallachia determined to form a Rumanian State, was elected Prince of Rumania under the above title by the Assemblies. He received the recognition of the Sultan in 1861. His reign was arbitrary and unconstitutional, and convinced the Rumanians of the impracticability of having as sovereign one of their own number. He followed the example of Napoleon III. in his methods, endeavoring to mask arbitrary government under plebiscites and universal suffrage. He became exceedingly unpopular, and was forced to abdicate in 1866.

ALEXANDER KARAGEORGEVITCH, kă′rȧ-gȧ-ôr′gȧ-vĭch (1806-85). Prince of Servia, born at Topola. He was for a time an officer in the Russian army, and was chosen prince in 1842. Wholly under Austrian influence, he angered the National party by his neutrality during the Crimean War, and in 1858 was deposed. He was accused of conspiracy in the murder of the Prince Michael (1868), and was sentenced to an imprisonment of twenty years *in contumaciam.* The few reforms accomplished during his reign are not to be attributed to him.

ALEXANDER LAND. A land area in the Antarctic (lat. 68° 43′ S., long. 70° to 75° W.). discovered by Bellingshausen in 1821.

ALEXANDER NEVSKI, nĕf′skê (1220-63). A Russian hero and saint. He was born at Vladimir, the son of Prince Yaroslav of Novgorod. In order to defend the country, which was attacked on all sides, but especially by the Mongols, his father left Novgorod, intrusting the government to his sons, Feodor and Alexander. Feodor died soon after. Alexander vigorously resisted the enemy, but Russia was forced to submit to the Mongol dominion in 1240 A.D. Alexander now fought to defend the western frontier against the Danes, the Swedes, and the Teutonic Knights. He received the surname of Nevski from the splendid victory over the Swedes, which he won in 1240 on the Neva, in the region where St. Petersburg now stands. In 1242 on the ice of Lake Peipus he defeated the Livonian Knights of the Sword, who had been instigated by the Pope to attack the Russian heretics. Upon the death of his father, in 1246, he became Prince of Vladimir. Pope Innocent IV. made a diplomatic attempt in 1251 to reunite the Greek and Roman Churches, since his military scheme had failed, and with this end in view sent an embassy to Alexander, which, however, proved ineffectual. To the end of his life Alexander remained a vassal of the Tartars or Mongols. Thrice he had to renew his oath of fealty to the Asiatic barbarians, making in each instance a journey to their camp. He died November 14, 1263, on his return from the last of these journeys. The gratitude of the nation perpetuated his memory in popular songs, and even canonized him. Peter the Great honored his memory in 1723 by building a magnificent convent on the spot where he had fought his great battle, and in 1725 founded the knightly order of St. Alexander Nevski.

ALEXANDER OF APH′RODIS′IAS. A Peripatetic philosopher, who was born at Aphrodisias in Caria and lived about 200 A.D. He was the most learned and intelligent Greek commentator of Aristotle (especially on the metaphysics) and was known as "The Exegetes," or "The Expounder." His works were early translated into Latin, and are in large part preserved. He also wrote original treatises, the most important of which are those *On Fate* and *On the Soul.* At the time of the Renaissance, a philosophic school which adopted Aristotle's views on immortality was named after him "the Alexandrist" (q.v.).

ALEXANDER OF HALES, hālz (Lat. *Alexander Halensis*) (?-1245). A famous English theologian, known as "the Irrefragable Doctor." He was born in Hales, Gloucestershire, but had attended the schools of Paris, had taken the degree of doctor, and had become a noted professor of philosophy and theology there, when (1222) he suddenly entered the Order of the Franciscans and became a lecturer among them. He resigned in 1238, and died as a simple monk in Paris, 1245. His chief and only authentic work is the *Summa Universæ Theologiæ* (best edition, Venice, 1576, 4 volumes), written at the command of Pope Innocent IV., and enjoined by his successor, Alexander IV., to be used by all professors and students of theology in Christendom. Alexander gave the doctrines of the Church a more rigorously syllogistic form than they had previously had, and may thus be considered as the author of the scholastic theology. Instead of appealing to tradition and authority, he deduces with great subtlety, from assumed premises, the most startling doctrines of Catholicism, especially in favor of the prerogatives of the papacy. He refuses any toleration to heretics, and would have them deprived of all property; he absolves subjects from all obligation to obey a prince who is not obedient to the Church. The spiritual power, which blesses and consecrates kings, is, by that very fact, above all temporal powers, to say nothing of the essential dignity of its nature. It has the right to appoint and to judge these powers, while the Pope has no judge but God. In ecclesiastical affairs, also, he maintains the Pope's authority to be full, absolute, and superior to all laws and customs. The points on which Alexander exercises his dialectics are sometimes simply ludicrous; as when he discusses the question whether a mouse that should nibble a consecrated wafer would thereby eat the body of Christ.

ALEXANDER OF THE NORTH, The. Charles XII. of Sweden. Sometimes so called from his warlike exploits.

ALEXANDER POL'YHIS'TOR (Gk. *Πολυΐστωρ*, *polyhistŏr*, very learned). A famous historian of the first century B.C., who was a native of Cottyacum, in Phrygia, but was educated at Miletus. In Sulla's war against Mithridates he was taken captive and brought to Rome, where Cornelius Lentulus gave him his freedom. Sulla afterward granted him Roman citizenship. Alexander gained the surname Polyhistor because of the great number of his historical works; but he also wrote on geography, grammar, science, rhetoric, and philosophy. All of his books have perished; but they were extensively quoted by Pliny the Elder, Diogenes Laertius, and particularly Clement of Alexandria and Eusebius. These excerpts show him to have been a rather poor compiler without marked literary ability or historical judgment. But he was evidently a great reader, and he perused Jewish and Samaritan works as well as Greek authors. Thus the world is indebted to Alexander for all extant information concerning such Jewish writers as Philo, the epic poet; Ezekiel, the tragedian; Eupolemus, the historian; Demetrius or Artapanus, the chronicler; Aristeas, the historian, and such Samaritan writers as Theodotus and Molon. The genuineness of these fragments has been doubted by Rauch and Cruice; but the defense by Müller, Freudenthal, and Schürer is quite convincing. Alexander refers twice to the Bible, and gives from Berosus the story of the Deluge and possibly also the legend of the confusion of tongues. The text of the fragments will be found in Eusebius, *Præparatio Evangelica* (London, 1842), Clement, *Stromata*, i., 21, 130 (Oxford, 1869); Müller, *Fragmenta*, iii., 211 ff., and translated in I. R. Cory's *Ancient Fragments* (London, 1876), J. Freudenthal, *Hellenistische Studien* (Breslau, 1875), and E. Schürer's *Geschichte des jüdischen Volkes*, iii., 346 ff. (Leipzig, 1898), discuss excellently the question of their genuineness.

ALEXANDER SEVE'RUS (c. 205-235). Emperor of Rome from 222 to 235 and cousin, adopted son, and successor of Elagabalus. The excellent education which he received from his mother, Julia Mammæa, rendered him one of the best princes in an age when virtue was reckoned more dangerous than vice in a monarch. He sought the society of the learned; Paulus and Ulpian were his counselors, Plato and Cicero were, next to Horace and Vergil, his favorite authors. Although a pagan, he reverenced the doctrines of Christianity, and often quoted that saying: "Whatsoever ye would that men should do to you, do ye even so to them." Beloved as he was by the citizens on account of his equity, he soon became an object of hatred to the unruly Prætorian Guards. His first expedition, against Artaxerxes, King of Persia, was happily terminated by a speedy overthrow of the enemy. But during one which he undertook against the Germans on the Rhine, to defend the frontiers of the Empire from their incursions, an insurrection broke out among his troops, headed by Maximinus, in which Alexander was murdered, along with his mother, not far from Mainz. The grateful people, however, enrolled him among the gods. After his death, military despotism obtained the ascendency.

ALEXANDER'S FEAST, or the Power of Music. An ode written by John Dryden for St. Cecilia's Day, 1697. It contains a number of lines now familiar from quotation.

ALEXANDER, The Paphlagonian. A celebrated impostor of the early part of the second century A.D., of whom Lucian gives a description. He was born at Abonouteichos, in Asia Minor, and after being for some time associated with another charlatan named Cocconas, of Byzantium, returned to his native place and established a pretended oracle of Æsculapius, whom he showed in the form of a serpent. Here he gained great reputation, which extended even to Italy. He was especially resorted to during the plague of 166 A.D.

AL'EXAN'DRA, Caroline Marie Charlotte Louise Julie (1844—). Queen of England. She is the daughter of Christian IX., King of Denmark, and was born at Copenhagen, December 1, 1844. She was married to Albert Edward, Prince of Wales, March 10, 1863, and has had three sons (two of whom have since died) and three daughters. She visited Russia at the time of the death of Alexander III., and has also made several visits to Denmark. She is interested in many benevolent enterprises, and is an accomplished musician, holding the degree of honorary musical doctor. Upon the accession of Albert Edward to the throne (1901), she became Queen of England. See Edward VII.

ALEXANDRA, Feodorovna. Empress of Russia. See Alexander III.

ALEXANDRE, ä'lȧks-än'drȧ, Rabbi Aaron (c. 1766-1850). A German chess-player, born at Hohenfeld, Bavaria. He went to Strassburg in 1893 as an instructor in German, and subsequently to Paris and London. He published an *Encyclopédie des échecs* (1837), and a *Collection des plus beaux problèmes d'échecs* (1846), both still valuable.

ALEXANDRE LE GRAND, ä'lȧks'äɴ'dr' le gräɴ'. The name of a tragedy by Racine, produced in 1665. The actress who played Axiane in this piece was the cause of a bitter rivalry between Racine and Molière.

AL'EXANDRET'TA, or **ISKANDERUN**, ĭs-kăn'de-ro͞on'. A seaport of Asiatic Turkey, in the vilayet of Adana, on the Gulf of Iskanderun, which forms the extreme northeast nook of the Mediterranean Sea (Map: Turkey in Asia, G 4). It is surrounded by hills in a very picturesque locality. The harbor is naturally one of the best on this coast. The town is the seat of an extensive trade in silk goods, cloth, and some raw products, amounting in 1905 to $12,124,000 for imports and $6,967,000 for exports. The population is estimated at 3000. Alexandretta is the seat of a United States vice-consul.

ALEXANDRI, ä'lĕks-än'drē. See ALECSANDRI.

AL'EXAN'DRIA (Ar. *Iskanderieh*). A city founded by Alexander the Great, in the winter of 332 B.C., on the site of an Egyptian town, Rhacotis (Map: Africa, G 1). It was situated at the Canopic mouth of the Nile, on the low ridge separating Lake Mareotis from the Mediterranean, and was laid out by the architect Dinocrates of Rhodes in the form of a parallelogram, with two main streets, crossing at right angles, though somewhat to the north and east of the centre lines. The other streets were also at right angles with one another, and the arrangement seems to have remained undisturbed for a long period, although the level of the city was raised and new streets laid out above the old ones. The city had a fine double harbor, formed by building a mole (the Heptastadion), seven furlongs in length, to the island of Pharos, on the northeast end of which was a lighthouse, regarded as one of the wonders of the world. (See PHAROS.) The small harbor, on the west, was open, but the large harbor was entered only by a narrow passage between the Pharos and a mole built out from the promontory Lochias on the east of the city. The city grew rapidly, and became one of the chief centres of the trade between the east and the west, while the generous policy of the Ptolemies, who made it their capital, attracted a large foreign population.

Egyptians, Greeks, and Jews were the chief elements, each gathering in a special quarter of the city. On Lochias was the royal palace, and the neighboring part of the city was filled with magnificent buildings, including the museum and the famous library (see ALEXANDRIAN LIBRARY), the monument of Alexander, the graves of the Ptolemies, the temple of Poseidon, and the Cæsareum—afterward a church, and once marked by the two obelisks known as Cleopatra's Needles, of which one was transported to the Thames Embankment in London in 1878, and the other to Central Park, New York, in 1881. These obelisks were originally erected by Thothmes III., and were brought to Alexandria by the Romans. Near here was the great emporium, and somewhat to the south lay the Bruchion (βρύχιον), a residence quarter. The great temple of Serapis lay in the southwest, or Egyptian quarter, where now stands a solitary column, the so-called Pompey's Pillar, a monolith of red granite 73 feet high, erected in 302 A.D. by the Roman eparch, Pompeius, in honor of Diocletian. Earthquakes and floods have changed the surface of the ground, and but few remains are now visible, though excavations conducted for Napoleon III. in 1866 by Mahmoud Bey revealed a number of paved streets, and those of 1898-99 by Dr. Noack have thrown much light upon the successive periods of building in the city. The original foundations of the time of Alexander rest on the natural rock, and are about 14⅔ feet below the paved streets, which seem to belong to an extensive rebuilding of the city by Antoninus Pius, and are now covered with the earth on which the modern city stands. The policy of Ptolemy Philadelphus and his immediate successors drew not only traders but learned men to the city, and Alexandria became the centre of Greek intellectual life during the third and second centuries B.C. (See ALEXANDRIAN AGE.) The city also developed a very characteristic type of art, which vied with that of Pergamus, and seems to have had great influence on the west. Alexandrian influence is marked at Pompeii and in Provence. Consult Mahmoud Bey, *Mémoire sur l'Antique Alexandrie* (Copenhagen, 1872).

In 30 B.C. Egypt passed into the hands of the Romans under Octavius. Under Roman rule Alexandria lost much of its former preëminence as the capital of the Hellenistic world; and though for many centuries it continued to be one of the greatest cities of the Empire, its decline from the magnificent prosperity it had enjoyed under the Ptolemies was rapid after the first century of the Christian era. The Jewish inhabitants of Alexandria joined in the great national revolt of 116 A.D., and in the desperate struggle which ensued the Jewish population was annihilated and a large part of the city was destroyed. The excesses of the Alexandrian mob, famous throughout the empire for its fickleness and its violence, plunged the city into misfortune twice during the third century. In 215 the seditious conduct of the populace led to a general massacre of the inhabitants at the order of the Emperor Caracalla. Forty-five years later civil war broke out among the different quarters of the city, lasting for twelve years and resulting in the destruction of the Bruchion, the richest district of Alexandria, with its ancient palaces, temples, and public buildings. With the rise of Alexandria as one of the great Christian capitals of the empire, religious tumult took the place, in large measure, of political dissension, and paganism and Christianity fought out their battle in many bloody riots. The triumph of the new faith was signalized in 389 by the destruction of the Serapion, the last refuge of the pagan belief, but religious peace was by no means secured. Between 413 and 415 the patriarch Cyril led mobs of monks against the heretics and Jews, and one of these militant bands tore to pieces the beautiful pagan priestess, Hypatia (q.v.). In 616 Alexandria was taken by Chosroes, King of Persia. In December, 641, it fell into the hands of Amru, the Mohammedan conqueror of Egypt. The story of the destruction of the famous library at the command of the Caliph Omar is discredited. With the Arabian conquest a period of swift decay set in. The commerce of the city was almost entirely diverted to other cities, the last remnants of its prosperity being destroyed by the discovery of the all-water route to India. Toward the end of the eighteenth century its population was probably less than 7000. On July 2, 1798, Alexandria was taken by the French, who held it until August 31, 1801. In the nineteenth century the city entered upon a new era of prosperity under the wise rule of Mehemet Ali. During the disturbances in connection with the rebellion of Arabi Pasha (q.v.), Alexandria was bombarded by the English fleet under Admiral Seymour, July 11-12, 1882.

Modern Alexandria is divided into two parts. The peninsula between the eastern and western harbors is inhabited chiefly by Mohammedans. It has crooked and narrow streets, a large number of mosques, and with the exception of the palaces of the wealthy Turks, few buildings worthy of notice. The European quarter is situated on the mainland south of the eastern harbor. It is well built, and has many of the improvements essential to a modern city. The centre of the European city is the Mehemet Ali Square, containing the statue of Mehemet Ali and surrounded by the official buildings and the finest residences of the Europeans. There are three theatres, a number of churches of different denominations, and the museum of Græco-Roman antiquities. Alexandria has two harbors. The eastern is accessible only for vessels of very light draught, and is used mostly by fishing vessels. The western harbor is the chief shipping centre, and was visited in 1904 by 4021 vessels, with a total tonnage of about 3,201,000. There is, besides, the outer harbor, protected by a mole nearly two miles long. Alexandria is at present one of the chief commercial ports on the Mediterranean and the principal port of Egypt. The chief articles of export are grain, cotton, beans, sugar, and rice. With Cairo, Alexandria is connected by rail since 1855 and by the Mahmudieh Canal. Along the latter are situated the summer residences of the Europeans. It is also connected by cable lines with Malta, Cyprus, Crete, and Port Said. The population was 315,047 in 1897. It consists chiefly of Mohammedans, with about 50,000 Europeans, mostly Greeks and Italians. Consult: Sharpe, *Alexandrian Chronology* (London, 1857); Kingsley, *Historical Lectures and Essays* (New York, 1889). See Egypt.

ALEXANDRIA, ă'lĕks-ăn'drê-ȧ. The principal town of the district of the same name in the government of Kherson, Russia, situated at the confluence of the Berezovka and Ingulets rivers, 216 miles from the city of Kherson, and about 950 miles from St. Petersburg. The principal occupations of its inhabitants are farming and cattle-raising, and much activity is displayed in its tanning, soap, and candle-making industries. Population, in 1885, 17,400; in 1897, 14,000.

AL'EXAN'DRIA. A magnificent villa and country seat in Peterhoff, one of the summer residences of the imperial family of Russia. Planned at the initiative of Alexander I., the noble structure was finished and the splendid grounds laid out only in 1830, during the reign of Nicholas I.

ALEXANDRIA. A city in Madison Co., Indiana, 48 miles northeast of Indianapolis, on the Cleveland, Cincinnati, Chicago and St. Louis, and Lake Erie and Western railroads (Map: Indiana, D 2). It has extensive manufactures of glass, paper mills, and iron and steel works. The city owns and operates its own water works. Alexandria was first settled in 1834, and is governed under a legislative act of 1905, which provides for a city council of six members, and places the mayor's term at four years. Pop., 1890, 715; 1900, 7221.

ALEXANDRIA. A city and county seat of Rapides Parish, La., 193 miles northwest of New Orleans, on the Texas and Pacific, the St. Louis, Watkins, and Gulf, the St. Louis, Iron Mountain, and Southern, and other railroads, and on the Red River (Map: Louisiana, C 2). It has fine government, high school, and bank buildings, and is across the river from a national cemetery which contains 1308 graves. Until the Civil War the State University was situated two miles north of the city. Alexandria is the seat of important commercial and manufacturing interests, principally in cotton, cottonseed oil and cake, sugar, molasses, lumber, etc. Settled in 1820, Alexandria was incorporated twenty years later. Under a charter of 1898 the government is vested in a mayor, elected biennially, and a city council, which controls appointments of the majority of administrative officials. The water-works and electric light plant are owned and operated by the municipality. Pop., 1900, 5648; 1906 (local est.), 9000.

ALEXANDRIA. A city and port of entry in Alexandria County, Va., on the Potomac River, about six miles below Washington, and on the Southern, the Pennsylvania, the Atlantic Coast Line, and the Chesapeake and Ohio railroads (Map: Virginia, G 3). Alexandria is 100 miles from the mouth of the Potomac, but the stream which forms its harbor is a mile wide. The city is accessible to large vessels, and, therefore, is able to control an extensive and increasing trade. It has several shoe factories, machine shops, planing mills, fertilizer plants, glass works, chemical works, brick works, and breweries. The city owns and operates its gas and electric light plants, and has a public library, and notably good schools. Alexandria was first incorporated in 1749, and is now governed by a charter of 1879, as revised in 1895. The mayor is elected for four years, and the city council is a bicameral body. The people elect all the important officers, such as treasurer, auditor, tax collector, etc., the city council electing the rest; the mayor has no power of appointment. At Alexandria, orginally called Bellehaven, Braddock made his headquarters before marching against the French in 1755, and here, on April 13, the governors of New York, Massachusetts, Pennsylvania, Maryland, and Virginia met to concert plans for the expedition. Alexandria lay within the territory ceded by Virginia to the United States in 1789, but was retroceded in 1846, and again became a part of Virginia in 1847. In 1814, the inhabitants, terrified by the approach of a British fleet, secured immunity from attack by paying the equivalent of about $100,000. During the Civil War Alexandria was occupied by federal troops, and was the capital of that part of Virginia which adhered to the Union and recognized Pierrepont as governor. Washington was one of the first vestrymen of Old Christ Church here. Pop., 1890, 14,339; 1900, 14,528; 1906 (local est.), 16,500. Consult *Celebration of the First Centennial of the Municipal Government of Alexandria* (Alexandria, 1880).

ALEXANDRIA. A village and county seat of Douglas Co., Minnesota, 130 miles northwest of Minneapolis, on the Great Northern and the Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: Minnesota, C 5). It is admirably situated in a lake region which is popular as a summer resort and is the centre of a productive wheat-growing and stock-raising district. The manufactures include flour, furniture, wagons, sleighs, stove fixtures, cutlery, and beer, and the village also has a large cold storage plant. The most notable building is the county court-house. Pop., 1890, 2118; 1900, 2681; 1905, 3051.

ALEXANDRIA BAY. A village in Jefferson Co., New York, on the St. Lawrence River, 30 miles north of Watertown, reached by trolley from Redwood, on the Rome, Watertown and Ogdensburg Railroad. It is the principal resort among the Thousand Islands, which lie opposite and below the village in the St. Lawrence. The entire series of islands forms a grand natural, though, to an extent, also artificially improved, park. Alexandria Bay was settled about 1830, and was incorporated first in 1879. Pop., 1890, 1123; 1900, 1511; 1905, 1854.

AL'EXAN'DRIAN AGE. With the loss of political liberty in Greece under Macedonian domination, creative power declined also, and Athens ceased to occupy the preëminent position in literature which she had so long held. During the third century B.C., Alexandria became the centre of science and literature under the direction of the Ptolemies, who used their wealth to attract poets, scholars, and artists to their capital. Ptolemy Soter invited to his court the learned Peripatetic philosopher, Demetrius of Phalerum, under whose advice he laid the foundations of the later collections and libraries. His son, Ptolemy Philadelphus (285-247), however, by his large expenditures, became the actual founder of the museum and libraries; his successor, Ptolemy Euergetes, (247-222), fostered especially mathematical and geographical investigations; and the succeeding rulers continued the support of learning in varying degrees. The centre of intellectual life was the library in connection with the museum. This was enriched in every possible way; the total number of books about 250 B.C. is put by Tzetzes at upward of 530,000. The museum had porticoes, lecture halls, and rooms in which scholars lived free of cost; some of the most eminent among these received large annuities from the royal purse. The school thus established resembled in many ways a university. The highest honor attainable was the position of librarian; this was held between 285 and 150 B.C. successively by Zenodotus, Callimachus, Eratosthenes, Apollonius, Aristophanes, and Aristarchus. The chief activity of these grammarians was directed to establishing standard editions of authors and the publication of explanatory comments on them. Lists of the best authors (Canons) were also drawn up, as of the five tragedians, the nine lyric poets, and the ten orators. Intellectual curiosity and the cosmopolitan character of the population led to translation into Greek of works in the Semitic tongues; the so-called Septuagint version of the Old Testament was made under Ptolemy Philadelphus.

Creative poetic impulse was now nearly dead, although bucolic poetry, epigram, and elegy still show originality. Most of the poets, however, were imitators who depended on art and not on genius. The most important names are Theocritus, Apollonius Rhodius, Callimachus, Aratus, Nicander, Euphorion, and Lycophron. At this time mathematics and astronomy also flourished. The most important names in the pre-Christian period are Euclid, Apollonius, Eratosthenes, Aristarchus, Hipparchus, and Hero, with whom must be reckoned also Archimedes, although his life was spent at Syracuse. Of the later scholars, Ptolemy (Claudius Ptolemæus) (second century A.D.) is famous for his geographical and astronomical works. Even after the fall of the Ptolemaic dynasty, the museum, libraries, and schools continued to make Alexandria a great intellectual centre for many centuries; the schools of philosophy in particular enjoyed great prosperity, but literary activity had centred in Rome. Under Cæsar a large part of the collection of books was burned; but the loss was repaired in some measure by the removal of the Pergamene library to Alexandria and by acquisitions elsewhere. During the fourth century A.D. the city suffered severely from the struggles between Greeks and Christians, and finally occidental learning ceased with the conquest by the Arabs in 641.

ALEXANDRIAN PHILOSOPHY. The Alexandrian philosophy is characterized by a blending of the philosophies of the East and of the West, and by a general tendency to eclecticism, as it is called, or an endeavor to patch together, without really reconciling, conflicting systems of speculation, by bringing together what seemed preferable in each. Not that the Alexandrian philosophers were without their sects; the most famous of these were the Neo-Platonists (q.v.). Uniting the religious notions of the East with Greek dialectics, they represent the struggle of ancient civilization with Christianity; and thus their system was not without influence on the form that Christian dogmas took in Egypt. The amalgamation of Eastern with Christian ideas gave rise to the system of the Gnostics (q.v.), which was elaborated chiefly in Alexandria.

On the museum and libraries, consult: Ritschl, *Die alexandrinischen Bibliotheken* (Breslau, 1838) and Couat, "Le Musée d'Alexandrie," in *Annales de Bordeaux* (Paris, 1879); also, in general matters, Simon, *Histoire de l'école d'Alexandrie* (second edition, Paris, 1845); Saint-Hilaire, *De l'école d'Alexandrie* (Paris, 1844-45), and Vacherot, *Histoire critique de l'école d'Alexandrie* (Paris, 1846-51).

ALEXANDRIAN ART. The style of art inaugurated in the time of Alexander, centring in the city of Alexandria. It prevailed throughout the Græco-Oriental States up to the time of the Roman conquest, and even then continued to exercise great influence on the formation of Roman art. Its characteristics were: (1) Regularity of plan in laying out cities; (2) love of the colossal, exaggerated, and picturesque in architecture and sculpture; (3) invasion of the element of color and pictorial effect in all arts; (4) love of the comic and the obscene; (5) rise of portraiture and *genre*. The old Hellenic poise had departed and the art was one of extremes; it sought its models in everyday life and did not care for types of gods or men. The art of Pompeii shows how this art permeated Roman civilization at the beginning of the Empire. Consult: G. Schreiber, *Die hellenistischen Reliefbilder* (Leipzig, 1894); Collignon, *Histoire de la sculpture grecque* (Paris, 1892-97); Gardner, *Handbook of Greek Sculpture* (London, 1896-97); Mitchell, *A History of Ancient Sculpture*

(New York, 1883), and Woltmann and Woermann, *Geschichte der Malerei* (English translation, New York, 1880).

ALEXANDRIAN CO′DEX. See Bible.

ALEXANDRIAN LI′BRARY. The plan for this, the most famous collection of the ancient world, seems to have been formed by Ptolemy I., Soter (died 283 B.C.), perhaps at the suggestion of the Athenian, Demetrius of Phalerum. The development of this plan and the connection of the library with the museum was the work of Ptolemy II., Philadelphus, about 275 B.C., who collected books on a hitherto unknown scale and placed them at the disposal of the learned men gathered in the museum. The management was intrusted to a series of scholars, whose labors led them to a careful study of Greek literary history and the classification of writers, with results of great importance for the transmission of classical texts to our own time. The first librarian was Zenodotus of Ephesus, under whom the poets were arranged. The first catalogue seems to have been the work of Callimachus, and included a classification of the authors, according to their principal themes, as historians, orators, etc. Under each author's name was given a brief biographical sketch, a list of his genuine and spurious works, the opening words of each work, a brief table of contents, and the number of lines occupied in the standard MS. Variations in names or titles were carefully noted. In the time of Ptolemy Philadelphus, the number of rolls in the main library was 490,000, and in the annex, in the temple of Serapis, 42,800. At the time of Cæsar's visit, in 47 B.C., the number had risen to 700,000, of which a large part was consumed in a great fire, which spread from the burning fleet. This loss was in part replaced by the library of Pergamus, which Antony gave to Cleopatra. In Roman times, however, the chief literary centre seems to have been the library in the Serapeum which was destroyed when the Christians sacked the temple (390 A.D.). The fate of the rest of the library after the loss of its most valuable part is unknown, but it seems likely that much of it had been lost before the surrender of the city to the Arabs. The story of the destruction of the books by order of the Caliph Omar is now universally discredited, as resting on very unreliable sources. Consult: Ritschl, *Die alexandrinischen Bibliotheken*, in his *Opuscula Philologica I.* (Leipzig, 1867-79), and Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit* (Leipzig, 1891-92).

AL′EXAN′DRIANS, Epistle to the. See Apocrypha, New Testament.

ALEXANDRIAN SCHOOL. A school of theology founded in Alexandria by Pantænus (180-203), taught by Clement of Alexandria and by Origen, and carried on until the end of the fourth century. It presented Christian truth as modified by philosophic speculation. It was well attended and very influential. Many of the great leaders of orthodoxy came from it, as Athanasius, Cyril, the two Gregories, and Basil. In biblical interpretation it stood for the allegorical method. Consult Kingsley, *Alexandria and Her Schools* (London, 1854).

AL′EXAN′DRINES. Rhyming verses, consisting each of twelve syllables of six measures. The name is most probably derived from an old French poem on Alexander the Great, belonging to the twelfth or thirteenth century, in which this measure was first used; according to others, it was so called from the name of the author of that poem. The Alexandrine has become the regular epic, or heroic, verse of the French, among whom each line is divided in the middle into two hemistichs, the sixth syllable always ending a word. In English, this rule is not always observed, as in the following verse from Spenser:

> That all the woods shall an|swer, and their echo ring.

The only considerable English poem wholly written in Alexandrines is Drayton's *Polyolbion;* but the Spenserian stanza regularly ends in an Alexandrine, and the measure occurs occasionally in blank verse and in our common heroic verse, as the last verse of a couplet:

> When both are full, they feed our blest abode,
> Like those that watered once|the paradise of God.—*Dryden.*

AL′EXAN′DRISTS. Those Renaissance followers of Aristotle who attached themselves with much zeal to the interpretation of Aristotle given by Alexander of Aphrodisias. They stood in bitter rivalry with the Averroists and the Thomists. The dispute concerned itself chiefly with the relation between the individual soul and the universal reason, and with the consequences of this relation for personal immortality. The Thomists, following Thomas Aquinas, held that Aristotle regarded reason as belonging to the individual soul; the Alexandrists maintained that Aristotle considered the individual soul as a merely animal and mortal function, which during the earthly life alone is rationalized by the informing power of universal reason; the Averroists held the intermediate view, viz., that the universal reason works upon the soul and makes it actual intelligence, and then incorporates this actual intelligence with its own eternal nature. Accordingly, the Thomists believed in individual immortality, the Alexandrists in no individual immortality, and the Averroists in the immortality of what has been the individual, but has lost its individuality, to be taken up as a permanent element in the life of God. The leading Averroists were Nicoletto Vernias (died 1499), Alessandro Achillini (died 1518), and Agostino Nifo (1473-1546); the leading Alexandrists were Ermolao Barbaro (1454-93) and Pietro Pomponazzi (1462-1524), the leading Aristotelian of his time; among the Thomists of the Renaissance may be mentioned Francis Suarez (1548-1617). Consult: Ueberweg-Heinze, *Grundriss der Geschichte der Philosophie* (Berlin, 1894-98; English translation by Morris, New York, 1871); E. Renan, *Averroès et l'Averroïsme* (Paris, 1852).

AL′EXAN′DRITE. See Chrysoberyl.

ALEXANDROPOL, ä′lĕks-ȧn-drŏ′pôl (*Alexander* + Gk. *πόλις*, *polis*, city), formerly Gumri. A fortified town in the Caucasus, 85 miles southwest of Tiflis, and 30 miles from Kars (Map: Russia, F 6). It is an important strategic point commanding the entrance to Armenia. The fort is 300 feet above the town level, and is large and strong, capable of accommodating 10,000 soldiers. The chief industry of the town is the manufacture of silk. It was the scene of several encounters between the Russians and the Turks before it fell into the hands of the former in 1853. Pop., 1885, 22,600; 1897, 32,000.

ALEXANDROV, ä'lĕks-än'drof. A town in Russia in the government of Vladimir, on an affluent of the Kliasma, a branch of the Volga, 72 miles east of Moscow (Map: Russia, E 3). It was a favorite summer residence of the Czar Ivan the Terrible, who introduced there the first printing-press known in Russia, in the sixteenth century. It has a magnificent imperial stud, established by the Empress Elizabeth in 1761 and completed about twenty years after. It is noteworthy for its convent, in the burial grounds of which are kept the remains of two sisters of Peter the Great. Pop., 1885, 6700; 1897, 6848.

ALEXANDROVSK, ä'lĕks-än'drofsk. A fortified town in the south of Russia, in the government of Ekaterinoslav, on the left bank of the Dnieper, below the cataracts, 56 miles south of Ekaterinoslav (Map: Russia, E 5). Inland productions are shipped here for the Black Sea, and it is known for its large storage houses and other storing facilities, but it has no considerable trade of its own. In its vicinity there are many hillocks, or mounds, which are in all probability the graves of the great chiefs of the ancient Scythians. Opposite the town is the Khortista Island, the chief seat of the famous Dnieper Cossacks in the seventeenth century. Pop., 1885, 6700; 1897, 16,393.

ALEXANDROVSK-GRUSHEVSKI, grōō-shĕf'skē. A town in the territory of the Don Cossacks, Russia, situated on the River Grushevka, about 20 miles from Novo-Tcherkask. It is well known for the rich coal mines in its vicinity, notably along the banks of the Grushevka. The anthracite coal of these deposits is of remarkable purity, containing as much as 94 per cent. of carbon, the highest percentage found anywhere. The discovery of coal in this region dates as far back as the latter part of the eighteenth century, but the exploitation of the mines was not commenced until 1839. The yearly output of the mines averages over half a million tons, and they employ about 10,000 men. Pop., in 1897, 16,250.

ALEXEI, ä'lĕks-ā', Alexandrovitch (1850-—). A Russian grand duke, fourth son of Alexander II., and uncle of Nicholas II., born January 14 (2), 1850. In 1872 he travelled through the United States. He was commander-in-chief of the fleet during the Russo-Japanese war, but the disasters which befell the naval forces of Russia in the course of the war followed by the repeated mutinies of the sailors in the Black Sea and the Baltic revealed the deplorable condition to which mismanagement and corruption had reduced the naval strength of the empire, and led to his resignation in the latter part of 1905.

ALEXEI MIKHAILOVITCH, mē-kī'lō-vēch (1629-76). Russian Czar, second of the Romanoffs. He succeeded his father, Michael Feodorovitch, in 1645. The young Czar yielded himself to the control of his Chancellor, Plessoff, and his tutor, Morosoff, and the avarice of these two advisers caused an insurrection in 1648, in which Plessoff lost his life. Popular discontent favored the plans of two pretenders to the throne—Demetrius III. and Ankudinoff. The latter, professing to be a son of the Czar Vasili Shuiski, was executed at Moscow in 1653. Alexei possessed good qualities, which appeared when he came to riper years. In his two campaigns against the Poles (1654-56 and 1660-67), he took Smolensk, overran and devastated almost the whole of Lithuania, and even secured for himself the possession of several provinces. He also gained a part of the Ukraine; and though his war with Sweden (1656-58) was unfortunate, he lost nothing by the following peace. Alexei conferred great benefits on his countrymen by the introduction of various important reforms into the Russian laws; he ordered translations of numerous scientific works, chiefly of a military nature, and even ventured on some ecclesiastical changes. In his private character he was amiable, temperate, and pious. By his second wife, the beautiful Natalia Naryshkin, he was the father of Peter the Great.

ALEXEI PETROVITCH, pĕ-trō'vēch (1690-1718). The eldest son of Peter the Great of Russia. He was born at Moscow. Because he had shown himself opposed to the reforms and innovations made by the Emperor, Peter threatened to exclude him from the succession to the throne. With this prospect he appeared to be satisfied, and declared his intention of spending the remainder of his days in a monastery. But when Peter the Great undertook his second tour in Western Europe, Alexei, under the pretense of following the Czar, escaped in 1717 to Vienna, and thence went to Naples. He was induced to return to Russia, where, by the ukase of February 14, 1718, he was disinherited, and an investigation was ordered, for the purpose of detecting persons concerned in his flight. A widespread conspiracy to undo all of Peter's reforms was discovered. Eudoxia, the mother of Alexei, Maria Alexeyevna, step-sister of the Czar, and several other personages were made prisoners, and either executed or otherwise punished. Alexei was condemned to death, but soon afterward received a pardon. The terror and agitation of the trial, however, and the actual torture to which he was subjected, led to his death in 1718. The Czar, to avoid scandal, ordered the proceedings at the trial to be published. Other accounts assert that Alexei was beheaded in prison. By his wife, Charlotte Christine Sophie, of Brunswick-Wolfenbüttel, Alexei left a son, who, as Peter II., was elevated to the throne in 1727. Consult Brückner, *Der Zarewitch Alexander* (Heidelberg, 1880).

ALEX'IANS. See Alexius.

ALEX'IS. In *The Faithful Shepherdess* (q.v.), by John Fletcher, the name of a shepherd.

ALEXIS, or **ALEX'IUS I., COMNE'NUS** (1048-1118) (Gk. 'Αλέξιος Κόμνηνος, *Alexios Komnēnos*). One of the ablest rulers of the Byzantine Empire. He was born at Constantinople, the son of John Comnenus, brother of the Emperor Isaac Comnenus. In his youth Alexis gave brilliant promise of the vigorous military genius which he afterward manifested, and at length, after a series of anarchic reigns of brief duration, his soldiers succeeded in elevating him to the throne, while the old and feeble Nicephorus Botaniates, his predecessor, was obliged to retire to a monastery (1081). Gibbon graphically paints the position and achievements of Alexis in the forty-eighth chapter of his *Decline and Fall of the Roman Empire.* Everywhere he was encompassed with foes. The Scythians and Turks were pouring down from the north and northeast, the fierce Normans, who had violently effected a lodgment in Italy and Sicily, were menacing his western provinces; and, finally, the myriad warriors of the First Crusade burst into his Empire on their way to Palestine, and encamped around the gates of his capital. Yet he contrived to avoid all perils and disgraces by the wisdom of his policy, the mingled patience and promptitude of his character, and his discipline in the camp. He reigned for thirty-seven years, and if it had been possible to preserve the Byzantine Empire in its integrity, a ruler like Alexis might have done it.

Undoubtedly, the great interest which attaches to Alexis arises from his relations to the Crusaders. Historians differ as to the purity and sincerity of his conduct toward them. His daughter Anna (q.v.), who wrote his life, defends his "policy" with filial piety; but it is clear that he entertained a profound dread and suspicion of the half-civilized Franks, and, knowing the weakness of his own Empire, was compelled to dissimulate. He promised them help, and persuaded them to go off into Asia; but he did not fulfill his promises, and simply used them as his instruments to reconquer from the Turks the islands and coasts of Asia Minor. Perhaps, however, little apology is needed for a monarch who "subdued the envy of his equals, restored the laws of public and private order, caused the arts of wealth and science to be cultivated, and transmitted the sceptre to his children of the third and fourth generations."

ALEXIS, or **ALEXIUS, II., COMNENUS** (c.1168-83). Emperor of Constantinople. He succeeded his father, Manuel I., about 1180, and was deposed and strangled by his uncle, Andronicus (1183).

ALEXIS III., ANGELUS (?-1210). Brother of Isaac Angelus, Emperor of Constantinople, whose throne he usurped in 1195. In 1203 his capital was besieged and taken by the Venetians and an army of French Crusaders, who reinstated Isaac II. On the capture of the city Alexis III. fled, and died a few years afterward in exile.

ALEXIS IV., ANGELUS (?-1204). Byzantine emperor in 1203-04, son of Isaac II. (Angelus). After the flight of his uncle, Alexis III., he was associated with his father in the government. After reigning only a few months, however, he was deposed and put to death by Alexis V.

ALEXIS V., surnamed Dukas Murtzuphlos (?-1204). Byzantine emperor in 1204. After the murder of Alexis IV. (1204), he usurped the throne, but at the end of a few weeks was deposed by the Crusaders, who had resolved on a partition of the Empire of the East. He fled to the Morea, where he was seized by the Latins, tried for the murder of Alexis IV., and cast from the top of Theodosius's Pillar.

ALEXIS, or **ALEXIUS, COMNENUS** (c. 1180-1222). A grandson of Andronicus I. When Constantinople was captured by the Crusaders in 1204, Alexis, taking advantage of the situation, captured Trebizond and some other cities on the Black Sea. He took the title of Emperor of Trebizond, and was obliged to carry on a continuous war against the Turks.

ALEX′IS (Gk. Ἄλεξις) of Thurii. A Greek comic poet of the third century B.C. He was born at Thurii, in Magna Græcia, was uncle and instructor of Menander, and wrote at Athens, where, according to Plutarch, at the age of 106, he died on the stage while being crowned as victor. Suidas assigns to him 245 comedies, of which the remaining fragments exhibit elegance and wit. His delineations of the parasite were skillful. See the edition by Hirschig (1840) and Meinike, in his *Fragmenta Comicorum*, Volume I.

ALEXIS, Willibald (1797-1871). The assumed name of Wilhelm Häring, a German novelist. He was born at Breslau, June 23, 1797, and died at Arnstadt, December 16, 1871. He was in his early works an imitator of Walter Scott, from whom his first romance, *Walladmor* (1823), and his second, *Schloss Avalon*, purported to be translations. Later Alexis took Prussia for his scenes. His best novels are: *Cabanis* (1832), *Der falsche Waldemar* (1842), and *Ruhe ist die erste Bürgerpflicht* (1852). Here the interest is well maintained, the characters clearly seen and firmly drawn, but the novels are marred by mannerisms and over-elaboration. Through all runs a vein of patriotic feeling that still sustains their popularity. Alexis's poems, though superficially attractive, lack depth and fertility of invention.

ALEXISBAD, ȧ-lĕks′ēs-bäd. A watering-place in the duchy of Anhalt, Germany (Map: Germany, D 3). It has two kinds of springs. The Selke spring is used for bathing, and contains chloride and sulphate of iron, while the Alexis spring contains carbonic acid, and is used for drinking purposes. Alexisbad was established as a watering-place by the Duke of Anhalt-Bernburg in 1810.

ALEX′IUS. A Roman saint of the fifth century, patron of the society of Alexians or Cellites. He is said to have been a Roman senator, but gave up the world for a life of poverty and celibacy. His relics are said to have accomplished marvelous cures. Alexius is honored in the calendars of the Latins, Greeks, Syrians, Maronites, and Armenians. His festival occurs on July 17. He was a favorite subject among the poets of the Middle-High-German period. Consult: Massmann, *Sankt Alexius Leben* (Quedlinburg, 1843); Paris and Pannier, *La vie de Saint Alexis* (1872); Blau, *Zur Alexislegende*, in the *Germania* (1888), Volume XXXIII., and A. Amiaud, *La légende syriaque de Saint Alexis* (1889).

AL′FA. One of the varieties of esparto (q.v.), a plant which grows in North Africa. Its fibre is valuable for paper-making.

ALFAL′FA (Sp., from Ar. *al-façfaçah*, the best feed), also called Lucerne. A leguminous plant, widely used in Europe and in parts of North and South America as a forage and hay crop for stock. The plant (*Medicago sativa*) is a native of the valleys of central western Asia. It has been cultivated in Europe for more than 2000 years, and was introduced into Mexico and South America at the time of the Spanish conquests. In 1854, it was brought from Chile to California, whence it spread rapidly over the arid regions of the Pacific and Rocky Mountain States, where it is now more extensively grown than any other forage crop. The plant is an upright, branching perennial, one to three feet high, with triple parted leaves and purple, pea-like flowers which grow in long, loose clusters. On loose, permeable soils, the top root frequently descends ten to twelve feet, and has been said to reach even fifty feet. Alfalfa has been raised with more or less success in different parts of the United States at elevations from sea level to 7000 feet. It grows best on rich, sandy, well-drained loams of a calcareous nature, and does not succeed on damp soils or tenacious clays. It seems especially adapted to the rich soils of the arid West, where water is supplied chiefly by irrigation. Young alfalfa plants are relatively tender, and two years are required thoroughly to establish a field; but when once established, the plant endures for many years. Newly planted alfalfa fields should be inoculated with alfalfa, sweet clover, or burr clover bacteria to insure successful growth. A knowledge of this fact and further studies showing its remarkable earliness, yielding capacity, and feeding value have resulted in the recent wide extension of alfalfa culture throughout the eastern States. The crop is cut when the plants are coming into bloom, and again from two to six times, according to the length of the season. The ordinary annual yield varies from three to eight tons of dry hay per acre, and sometimes reaches ten or twelve tons. The crop is seeded either broadcast or in drills, at the rate of fifteen to twenty-five pounds of seed per acre. Alfalfa, like other leguminous plants, takes up nitrogen from the air. It also brings up from the subsoil considerable amounts of potash, phosphoric acid, lime, and other mineral matters, and is valuable for green manuring. The roots and stubble from an acre contain about twenty pounds of phosphoric acid, thirty-eight pounds of potash, and ninety pounds of nitrogen.

A variety of alfalfa known as Turkestan alfalfa (*Medicago sativa turkestanica*), is the chief forage plant grown in Central Asia and Turkestan for cattle. It has been widely tested in the United States. In the States west of the Mississippi River and north of Kansas and California, it seems to endure drought better, is not so easily affected by freezing, and gives better results on strong, alkali soils than the alfalfa commonly grown (*Medicago sativa*). Two other forms of alfalfa, sometimes cultivated, are the intermediate alfalfa (*Medicago media*), and the yellow or sand lucerne (*Medicago falcata*), the seed of which are sometimes used to adulterate that of *Medicago sativa*. These varieties are not so valuable as the true alfalfa.

Feeding Value. Alfalfa is used as a soiling crop, as pasturage, and in the form of silage and hay. Green or cured as hay, it is relished by all farm animals. It may be used either for fattening stock or for milk production. The green product has the following percentage composition: water, 71.8; protein, 4.8; ether extract, 1; nitrogen free extract, 12.3; crude fibre, 7.4; and ash, 2.7. When cured as hay, alfalfa has the following percentage composition: water, 8.4; protein, 14.3; fat, 2.2; nitrogen free extract, 42.7; crude fibre, 25, and ash, 7.4. Like other leguminous crops, alfalfa is comparatively rich in nitrogen. The different crops and cuttings do not vary greatly in composition. When alfalfa flowers begin to appear, the stalk constitutes about 50 or 60 per cent., and the leaves 40 or 50 per cent. of the whole plant. At the usual time of cutting, alfalfa leaves contain one-third more of the total dry matter of the crop. The leaves contain one-quarter to one-third as much crude fibre as the stalks, and two or three times as much albuminoids. As shown by experiments with cattle, the following percentage amounts of the ingredients are usually digested: 60.7 per cent. of the total organic matter, 72 per cent. of the protein, and 69.2 per cent of the nitrogen free extract. Of the crude fibre of alfalfa hay, about 46 per cent. is on an average digestible. Chemical analysis and digestion experiments show that alfalfa compares very favorably with red clover, both as green fodder and as hay. When fed as a soiling crop, it should be partially wilted or mixed with hay or straw. In dry regions of the West it is much used for pasturage, especially in the fall. But there is always more or less danger of its causing the cattle to bloat or of the plants being killed by too close pasturage. Alfalfa has proved a satisfactory green crop for pigs. It is as hay that alfalfa finds perhaps its most extended use. Cattle, sheep, and horses seem to thrive on it. To secure a well-balanced and economical ration, alfalfa hay, which contains a fairly large proportion of protein, should be fed with corn, wheat, oat straw, root crops, etc., which contain comparatively large amounts of carbohydrates and fat. Recently alfalfa hay has been ground quite extensively and put upon the market as alfalfa meal. It contains approximately 15 per cent. of protein, about the same as wheat bran; and is sold as a concentrated feeding stuff, or mixed in varying proportions with beet molasses to furnish balanced rations for different purposes.

Alfalfa Diseases. The principal diseases to which alfalfa is subject are a leaf spot and a root-rot. The leaf spot, due to the fungus *Pseudopeziza medicaginis*, is found in nearly every locality where alfalfa is grown. Sometimes seedling plants are attacked, but usually the fungus occurs on the leaves of older plants. It may be recognized by the occurrence of minute brown spots of irregular shape upon the green or discolored leaflets. The disease readily survives the winter, and in severe attacks to prevent spreading the plants should be covered with straw and burned. The root-rot is caused by a fungus, *Ozonium auricomum*, which attacks the plants at the crown, following the root downward for some distance, and ultimately killing the plant. The disease spreads in the field, in almost perfect circles, and sometimes causes, in a single season, bare places fifty feet or more in diameter. Alfalfa is also attacked by a parasitic flowering plant known as dodder (q.v.).

Bibliography. J. G. Smith, "Alfalfa, or Lucerne," *United States Department of Agriculture, Farmers' Bulletin, 31* (Washington, 1896); *Colorado Experiment Station Bulletin, 35; Kansas Experiment Station Bulletin, 85; Wyoming Experiment Station Bulletin, 33; Utah Experiment Station Bulletin, 31; New Jersey Experiment Station Bulletin, 148*. See also bibliography of Alkali Soil.

AL-FARABI, ăl'fȧ-rä'bē, Abu Nasr Mohammed ibn Tarkhan ibn Uzladj al-Farabi (?-950 A.D.). One of the earliest of Arabian philosophers, who lived in the tenth century. His family was Turkish. He was born in Farab, but proceeded to Bagdad, where he devoted himself to the study of medicine, mathematics, and philosophy. From Bagdad he went to Haleb (Aleppo), where, except for his close relations to the Saif ed Daula, the ruler of the place, he lived a life of scholastic retirement. He died in Damascus, while on a visit to that place, in company with Saif ed Daula. Although a prolific writer, who occupied himself with philosophy, medicine, natural science, mathematics, and music, Al-Farabi never worked out a system of philosophy, and since only part of his works have survived, it is not easy to get a comprehensive view of his activity. His philosophy is largely influenced by Aristotle, although it has also in it a Neo-Platonic element. He was distinguished for the clearness of his thought and the excellence of his style, but such was the fame acquired by his successor Avicenna, that Al-Farabi was almost completely eclipsed. Among his writings was an encyclopædia of the sciences. Consult M. Steinschneider, *Al-Farabi* (St. Petersburg, 1869); F. Dieterici, *Al-Farabis Philosophische Abhandlungen* (Leyden, 1890).

ALFIERI, ȧl-fyä′rê, Cesare, Marquis di Sostegno (1796-1869). An Italian diplomat and statesman, a kinsman of Vittorio Alfieri, the poet. He was born at Turin, August 13, 1796, and, having early devoted himself to affairs of State, was successively secretary of the Sardinian legations at Paris, The Hague, St. Petersburg, Berlin, and Florence. Returning to Turin in 1831, he was associated with Cavour. When the Reform Commission was appointed, Alfieri became its president, and accomplished much for the elevation of universities and for advanced study in general. He was for a very short time in 1848 Prime Minister, then Vice-President of the Senate, and, from 1856 to 1860, its president. He died at Florence, April 16, 1869.

ALFIERI, Vittorio, Count (1749-1803). The most important of the Italian dramatic poets, a younger contemporary of Metastasio and Goldoni, a man as unique in his personality as in his writings, and held in honor to-day by his countrymen less for the tragedies which first made him famous than as the reviver of a national spirit in modern Italy. The salient facts of his life are known mainly through his *Autobiography*, a work exceptional in its class for its frank sincerity and keen personal interest. He was born January 17, 1749, at Asti, in Piedmont, which in those days was looked upon by the mass of Italians almost as alien territory. Of the misspent youth which he afterward so keenly regretted, eight years were passed in the Academy of Turin—years of "uneducation," he calls them. Eight years more were equally wasted in roving through France, England, and Holland, and in an idle and dissolute life in Turin. It was not until his twenty-sixth year and his fourth serious infatuation—this time for a certain Marchesa Turinetti di Prie—that he felt himself inspired with lofty aims, and especially with a desire to make a name for himself in the field of dramatic poetry. Under this inspiration he made his first dramatic essay, some scenes of a *Cleopatra*, resumed his serious studies, and removed to Florence in order to perfect himself in the correct Tuscan idiom, for his Italian at this time was scarcely better than his French. In Florence he first met the Countess of Albany, the unhappy wife of Charles Edward Stuart, and formed for her that life-long attachment which he defined as a "degno amore," and which has become historic. After her separation from her husband in 1780, Alfieri joined her for a time in Rome, and after the Pretender's death, was seldom separated from her during the remainder of his own life. There is, however, no ground for believing that they were secretly married. For several years they lived in Paris, but narrowly escaped in the Reign of Terror, and being forced to flee, took refuge once more in Florence. Here Alfieri died October 8, 1803, and here, in the church of Santa Croce, the Countess caused a monument to be erected by Canova to his memory.

Besides his tragedies and autobiography, Alfieri's literary activity produced numerous sonnets and odes, his *Misogallo*, a fierce denunciation of France, in mingled prose and verse, some unimportant prose writings, and six comedies, four of which, *L'Uno, I Pochi, I Troppi, L'Antidoto*, form a political tetralogy intended to show that the best government is that founded upon the will of the people. The series of tragedies began with *Cleopatra*, first produced at Turin in 1775, and continued until 1789. The most important are *Virginia*, *Agamennone*, *Oreste*, *Timoleone*, *Maria Stuarda*, and *Saul*, which is still regarded as his masterpiece. They are all obviously cast in one and the same mold, and that a narrow one; all classically correct, yet full of dignity and lofty sentiments. The principles which he laid down he rigidly followed. He did not permit himself to imitate or even to read Shakespeare; but adhered to the model of Greek and French tragedy, and followed to a large extent the classic unities. A tragic subject, in his opinion, was one which permitted a powerful excitation of good or evil passions; his own themes were regularly drawn from some stirring event of history or mythology. His highest aim was to unite "artistic truth with moral truth, beauty with morality." He wished the theatre to be "a school in which men might learn to be free, brave, and generous, inspired by true virtue, intolerant of violence, full of love for their country, with a true knowledge of their personal rights, and in all their passions enthusiastic, upright, and magnanimous." It was Matthew Arnold who summed up Alfieri as "a noble-minded, deeply-interested man, but a monotonous poet;" but his poetry was not found monotonous by his own or the following generation. What he did for tragedy was carried on by Monti, by Foscolo, by Pellico, and others. What he did for Italian unity is harder to measure. An entire generation of patriots was inspired by his *Virginia* and *Brutus* and *Timoleone*, and drew freely upon them for passages with which to inflame their hearers. His persistence in regarding himself primarily a native of Italy, and in speaking and writing in classic Tuscan, bore special fruit in his native Piedmont. In the words of his fellow-countryman, Gioberti, "the revival of civil order throughout the peninsula, the creation of a laic Italy, is due to Vittorio Alfieri, who, like a new Dante, was the true secularizer of the spirit of the Italian people, and gave to it that strong impulse which still lives and bears fruit."

The complete edition of Alfieri's works is that published at Pisa (1805-15), in twenty-two volumes. The first edition of the tragedies is that of Siena (1783), containing only ten tragedies. Good editions of selected tragedies are those edited by G. Falorsi (Florence, Barbera); Pisaneschi (Turin, Paravia); and Trevisan (Verona). For biographical and critical details, consult: *Autobiography*, translated by Lestor (New York, 1845); Centofanti, *Tragedie e vita d'Alfieri* (Florence, 1842); Copping, *Alfieri and Goldoni, Their*

Lives and Adventures (London, 1857); Howells, *Life of and Essays on Alfieri* (Boston, 1877); Antonini and Cognetti, *Vittorio Alfieri* (Turin, 1898); G. Carducci, *Primi Saggi* (Bologna, 1889); and E. Panzacchi, *Vita italiana nel settecento* (Milan, 1896).

ALFILARIA, ăl-fĭl′ȧ-rē′ȧ. See Geranium.

ALFINGER, ăl′fĭng-ẽr, Ambrosiode (?-1532). A German soldier of fortune, who in 1528 became the agent of the Welser family of Augsburg, to finish for them the conquest of Venezuela; this being the condition under which they held title to the country from Castile. He led out a company of Germans, but his expedition to the neighborhood of Lake Maracaibo and to New Granada was notorious for its cruelties, and he was killed by an Indian.

AL′FIO′NA (Mex. Sp.). The largest of the California surf fishes. See Surf Fish.

ALFONSINE, ăl-fŏn′sĭn, or **ALPHONSINE TA′BLES**. Certain astronomical calculations made by the ablest men of the period for Alfonso X. of Castile. A room in the palace at Segovia is still shown as Alfonso's observatory. The tables were completed in 1252, the year when Alfonso came to the throne, and first published in 1483.

ALFON′SO I. of Castile and VI. of Leon, "the Valiant" (1030-1109). He was the son of Ferdinand the Great, King of Castile and Leon. Leon was given to him by his father; Sancho, the eldest son, received Castile; Garcia, youngest of the three, a part of Galicia and Portugal. Alfonso came to the throne in 1065. War soon broke out between the brothers, and in 1068 Sancho defeated Alfonso in a bloody battle on the Pisuerga. Three years later Alfonso defeated Sancho on the Carrión; but Sancho, reënforced, it is said, by the renowned Cid, Roderigo Diaz de Bivar, nearly annihilated the Leonese army, took Alfonso prisoner, compelled him to abdicate, and shut him up in a monastery. Alfonso escaped and sought shelter with the Moorish King of Toledo. Sancho took possession of Leon and immediately attacked Garcia, defeating and capturing him at Santarem. In 1072 Sancho was assassinated by a Castilian knight, and Alfonso, upon solemnly declaring himself innocent of the murder, was reinstated in his kingdom of Leon, to which was added Castile. His brother Garcia, who was preparing to recover the throne of Galicia, was treacherously invited to his court, made a prisoner, and died in confinement ten years later. Alfonso now ruled over nearly all of his father's kingdom, and went to the assistance of the Moorish King, who had befriended him and whose kingdom was being invaded by Cordovans. Alfonso's gratitude ended with the death of the old king; he did not scruple to attack his son, and soon captured the city of Toledo, thus adding New Castile to his dominions. Alfonso was monarch of most of Christian Spain, when a powerful Almoravide army from Africa, with the assistance of the King of Seville, inflicted upon him a terrible defeat, in 1086, near Zalaca. He gradually regained strength, but in 1108 the Moors destroyed his army and killed his only son. The next year Alfonso died and was succeeded by his daughter, Urraca, who became the wife of Alfonso I. of Aragon. His illegitimate daughter, Theresa, married Henry of Burgundy, and gave birth to the first King of Portugal.

ALFONSO III., surnamed "the Great" (848-912). King of Leon, Asturias, and Galicia. He succeeded his father, Ordoño I., in 866, but had to maintain his rights by force of arms against Count Fruela, who had usurped the throne. Having caused the latter to be executed, by the order of the Senate of Oviedo, he proceeded sternly to reduce to obedience the powerful nobility of the kingdom, who did not wish the monarchy to remain in one family. From 870 to 901 he was constantly at war with the Moors, and gained many victories. Crossing the Douro, he humbled Coimbra, penetrated to the Tagus and Estremadura, enlarged his territories by a portion of Portugal and Old Castile, and repeopled the conquered and desolate Burgos, making of it the first town in Castile. These wars entailed great expense and misery upon the nation. As a consequence, in 888, Garcia, the son of Alfonso, raised the standard of revolt. Alfonso collected his forces, conquered his son, and threw him into prison. But Garcia's mother, with the help of several of the grandees, excited a new conspiracy, which resulted in the abdication of the monarch in favor of his imprisoned son, in 910. In order, however, to be still useful to his country, Alfonso became commander of Garcia's forces in an expedition against the Moors. After returning in triumph, he died at Zamora, December 20, 912.

ALFONSO VI. of Leon. See Alfonso I. of Castile.

ALFONSO X. (1221-84). King of Leon and Castile, surnamed "the Astronomer," "the Philosopher," or "the Wise" (*El Sabio*). He succeeded his father, Ferdinand III., in 1252. As early as the storming of Seville, in 1248, he had given indications of his courageous spirit. But instead of wisely confining his efforts to the conquest of the Moors and the repression of the nobility, he lavished the resources of his kingdom in efforts to secure the imperial throne of Germany, to which he was elected in 1257. Richard of Cornwall was chosen in opposition to him. Neither could succeed in securing recognition, and ultimately the imperial crown was placed upon the head of Rudolph of Hapsburg (1273). While Alfonso was striving for the crown of the Holy Roman Empire, his throne was threatened by the turbulence of the nobility, and at the same time he had to contend with the Moors. The latter, however, he defeated, in 1262, in a bloody battle. In 1270 an insurrection broke out in his dominions, at the head of which was his brother Philip. Later his son Sancho also rebelled, and in 1282 deprived him of his throne. He now sought the help of the Moors, but after fruitless efforts to recover his power, he died at Seville, April 4, 1284. He was the most learned prince of his time, and has acquired lasting fame through the completion of the code of laws called the *Siete Partidas*, which 200 years later became the universal law of the land. There are still extant several long poems of his, a work on chemistry, *El libro del tesoro*, translated later by Brunetto Latini (q.v.), and various translations of Arabic works. He labored much to revive knowledge, increasing both the privileges and professorships of the University of Salamanca. He sought to improve the Ptolemaic planetary tables, whose anomalies had struck observers even at that early time. For this purpose, in 1240, he assembled at Toledo upward of 50 of the most celebrated astronomers of that age. His improved tables, still known under the name of the Alfonsine Tables, were completed in 1252. See ALFONSINE TABLES.

ALFONSO I. OF NAPLES AND SICILY. See ALFONSO V. OF ARAGON.

ALFONSO I. (?-1134). King of Navarre and Aragon, who succeeded Pedro I., in 1104. His marriage with Urraca, heiress of Alfonso VI., of Leon and Castile, brought that kingdom under his sway. Misunderstandings soon arose with Urraca, and a divorce was granted. Alfonso, however, continued to fight against Castile, thus prolonging the final strife with the Moors. He was called "emperor" and "fighter;" the latter name he won by his victories over the Moors. In 1114 he began the siege of Saragossa, which he captured four years later. In 1120 he slew 20,000 Moors on the field of Daroca. In 1123 he invaded Valencia, and two years later he went to the aid of the Christian Moors in Andalusia. In 1130 he crossed the Pyrenees and captured Bordeaux and Bayonne. In 1133 he besieged Fraga on the Cinca. The contest was long and severe, bringing from Africa 10,000 Almoravides. Finally, however, the Christians were defeated. Alfonso died in 1134.

ALFONSO (Port. *Affonso*) **I.** (1109-85). First King of Portugal, son of Henry of Burgundy, conqueror and Count of Portugal. His father died when he was about two years old, and the management of affairs fell into the hands of his ambitious and dissolute mother, Theresa of Castile, from whom he was compelled to take it by force on attaining his majority. He was forced into war with Castile, whose supremacy he did not recognize. He then attacked the Moors and won a brilliant victory on the plains of Ourique (1139), where, according to the legend, 200,000 Moors perished. From that day he took the title of king. He was crowned by the abbot of Larvao, and the coronation was sanctioned by the Pope in 1169. On October 23, 1147, he took Lisbon, with the aid of some English crusaders under William Longsword, on their way to the Holy Land. The booty was so rich that most of the Crusaders returned home. In 1158, after a two months' siege, he became master of Alcazar de Sal. He took by assault the fortress of Santarem from the Saracens, in 1171, and annihilated the garrison; at the same place he defeated the Almohade ruler, Jusef-ben-Jakub, in 1184. He invited to his land the Knights Templars and the Knights of St. John, and established the Orders of Avis and of St. Michael. He died at Coimbra, December 6, 1185.

ALFONSO V. (1432-81). King of Portugal, surnamed "the African," in honor of his victories over the Moors in Algiers. At his father's death, in 1438, there was a fierce struggle for the regency between the Queen Mother and the uncles of the King. Finally the Queen was defeated and his uncle Pedro became regent. In 1448 Alfonso assumed the government, declared his uncle a rebel, and defeated him in battle. After a campaign in Africa, Alfonso undertook to seize upon Castile and Leon, but was defeated at Toro. Alfonso endeavored to get assistance from the King of France, but, finding that he was being deceived, he abdicated in favor of his son, Juan, in 1476. He was forced, however, to ascend the throne again. In 1479 he signed the treaty of Alcantara with Castile. In 1481 he died of the plague. He founded the Order of the Tower and Sword under the invocation of San Diego. In his reign the explorations of the Portuguese along the western coast of Africa were pushed beyond the equator.

ALFONSO V. (1385-1458). King of Aragon, Naples, and Sicily. He reigned from 1416 to 1458, receiving the surname 'Magnanimous,' because on his accession to the throne he destroyed a document containing the names of all the grandees who were hostile to him. He is renowned chiefly for having brought southern Italy under the dominion of Aragon. In 1420 he attacked Corsica, but speedily hastened to Naples at the request of Queen Joanna II., who in return for his assistance against Louis of Anjou named him as her heir. For some time he enjoyed her highest favor; but in 1423, having thrown into prison her minion, Caracciolo, who was his enemy, the Queen declared for his rival, Louis. At her death, in 1435, Alfonso resolved to claim the kingdom; but René of Anjou, whom Joanna had appointed her successor after the death of Louis, opposed him. Rome and Genoa sided with René. The Genoese fleet inflicted a most serious defeat upon the Aragonese fleet, and Alfonso was captured. He was sent to the Duke of Milan, who set him at liberty, and formed an alliance with him. After several battles Alfonso overthrew his adversary and entered Naples in triumph. Having once firmly established his power, he proceeded to suppress the disorders which had sprung up during the reign of Joanna. He died at Naples, June 27, 1458.

ALFONSO VI. (1643-83). King of Portugal. An incapable and dissolute prince, who drove his mother, the regent, from court, and put the supreme power into the hands of a worthless favorite, Count Castel-Melhor. His wife, whom he neglected, conspired with his brother, Dom Pedro, against him. Alfonso was dethroned and imprisoned (1668), and Dom Pedro took his place as King of Portugal, and, after the death of Alfonso, as husband of his queen.

ALFONSO XII. (1857-85). King of Spain. The son of the deposed Queen Isabella II. He was born at Madrid and was proclaimed king December 30, 1874. On January 23, 1878, he married Princess Maria de las Mercedes (youngest daughter of the Duc de Montpensier), who died soon after. In 1879 he married Archduchess Maria Christina of Austria, by whom he had three children. Returning from an informal visit to Germany, 1883, he was publicly insulted in Paris, and war with France was for a few days thought probable. Alfonso governed wisely but was unable to reconcile the numerous factions into which the country was divided. His posthumous child, Alfonso XIII., succeeded him.

ALFONSO XIII. (1886—). King of Spain. He was born May 17, 1886, the posthumous son of Alfonso XII. and of Maria Christina, Archduchess of Austria, who was appointed regent during his minority. The early reign of the young king was marked by mutinies abroad, while at home dissatisfaction found expression in cabinet crises and military insurrections, labor riots, and anarchistic disturbances. The unfortunate war against the United States led to the practical annihilation of Spain's colonial empire. The King assumed personal charge of the government on attaining his sixteenth year (1902). His frank and courageous, though somewhat impulsive nature gained him the affection of the nation. On May 31, 1906, he married Princess Ena, daughter of the late Prince Henry Maurice of Battenberg and Princess Beatrice, daughter of Queen Victoria. On their wedding day the royal pair narrowly escaped death in a bomb explosion, the work of anarchists, which killed a score of persons about the King.

ALFONSO MARIA DE LIGUORI, mȧ-rē′ȧ dȧ lē-gwō′rē. See Liguori.

ALFONSO OF BOUR′BON (1849—). Infante of Spain, a brother of the pretender to the crown, Charles VII., nephew of the former pretender, Don Carlos. (See Carlos, Don.) He participated in the struggle of the Carlists (1873-74), and together with his wife, Maria de las Nievas, became notorious by reason of sanguinary deeds at the siege of Cuenca.

ALFORD, ạl′fẽrd, Henry, D.D. (1810-71). An English biblical critic and poet. He was born in London, October 7, 1810, and educated at Trinity College, Cambridge. He became Fellow of Trinity in 1834, Vicar of Wymeswold, a college living, in the diocese of Peterborough, 1835; minister of Quebec Chapel, Marylebone, London, 1853; Dean of Canterbury, 1857. He was very versatile, could play and sing, carve and paint. He wrote poetry and sermons. He was a literary critic and editor. But his reputation rests upon his edition of the Greek New Testament, in which for the first time the treasures of German linguistic and exegetical studies were introduced in comprehensive fashion to those unfamiliar with German. It was begun in 1845 and the fourth and last volume published in 1861. For the day it was a great service. He enabled the mere English reader to reap a great part of his harvest by his *New Testament for English Readers* (London, 1868, 4 volumes). Other of his writings have had much vogue, especially his poetry, *The School of the Heart, and Other Poems*, etc., which is characterized not so much by depth or originality as by freedom from affectation, obscurity or bombast. Among his latest writings was *A Plea for the Queen's English* (sixth edition, 1880), which excited considerable discussion. He also published several volumes of sermons. He died at Canterbury, January 12, 1871. Consult *The Life of Dean Alford*, by his widow (London, 1873).

AL′FRED. A village in Allegany County, N. Y., 9 miles southwest of Hornellsville, on the Erie Railroad (Map: New York, C 3). Alfred was settled in 1807 and was incorporated in 1887; it is known principally as the site of Alfred University, a Seventh Day Baptist institution, organized in 1836. The New York State School of Clay Working and Ceramics is also here. Pop., 1890, 786; 1900, 756; 1905, 912.

ALFRED, or **ÆLFRED**, the Great (849-901). King of Wessex from 871 to 901. He was born at Wantage, in Berkshire, in 849. His father was Æthelwulf, King of the West Saxons. Alfred, the youngest of five sons, succeeded to the throne in 871, on the death of his brother Æthelred. His reign, which lasted more than thirty years, is noteworthy first, because of the wars with the Danish invaders; second, because of the interest which the King took in education. Before discussing his real achievements, however, it may be well to speak briefly of some things erroneously attributed to him. In the popular legends he has been regarded as the author of many reforms and institutions which were in no way due to him. His real and great merits have been overlooked because of the actions incorrectly credited to him. Except for the false statements in many secondary works, it would be unnecessary to say that he did not institute trial by jury, and that he was not the founder of the University of Oxford. The picturesque tales of his hiding from the Danes, of the burned cakes, and of his visit to the Danish camp disguised as a harper, are inventions of a later age.

Alfred became king in the midst of a Danish invasion. After several battles he was able to make peace with the enemy, probably by paying them money. In the following years Danish marauding expeditions were frequent, and in 878 there was a great invasion. For a few months the Danes were successful almost everywhere, and met with no general resistance. About Easter, Alfred established himself at Athelney, and gathered there all the forces that he could. Seven weeks afterward he marched to Brixton, gathering troops as he went, and in the battle of Ethandun, probably Edington in Wiltshire, he defeated the Danes and captured their stronghold. The Danish King Guthrum was baptized, and the peace of Wedmore followed. There were some less important engagements in the following years, but on the whole, for the next fifteen years Alfred was able to give his time to the internal affairs of his kingdom. In 893 the Danes, who had been driven away by Arnulf (q.v.), King of Germany, made a descent upon England. For more than four years the warfare went on almost continuously, but at last the Danes were driven out. These Danish invasions had an important influence on the history of England. By crushing the individual kingdoms, they worked, unwittingly, for the unity of England. Alfred, by withstanding them successfully, made his kingdom the rallying point for all the Saxons, and prepared the way for the eventual supremacy of his descendants. He died October 28, 901.

Alfred was an enthusiastic scholar and a zealous patron of learning. When he came to the throne, as he himself wrote, he found little or no interest in education, and few learned men. He invited to his court native and foreign scholars, of whom the best known are Asser and John Scotus Erigena. He labored himself, and encouraged others to labor, for the education of his people. The composition of the Anglo-Saxon *Chronicle* may have been due to his initiative. He himself translated works which he thought would be useful to his people, and instead of merely translating literally, he expanded or omitted portions in order to make the work more serviceable. His principal works were translations of the following: Boëthius, *Consolation of Philosophy;* Orosius, *History of the World;* and Gregory the Great, *Pastoral Care.* Of the last there is an excellent edition in the publications of the Early English Text Society. He is said to have translated, or to have had translated, the *Soliloquies of St. Augustine.* It was believed formerly that Alfred translated Bede's *Ecclesiastical History*, but more critical study has shown that the translation is made into the Anglian dialect and not the West Saxon. It was certainly not the work of Alfred, although it may have been made under his direction. See Miller, *The Old English Version of Bede's Ecclesiastical History*, Early English Text Society (London, 1890); Schipper, *König Alfreds Uebersetzung von Bedas Kirchengeschichte* (Leipzig, 1897).

His laws show no striking changes from the laws of earlier kings; in fact, he disclaimed originality and spoke of his work as mainly a compilation of existing laws. But they are marked by two characteristics which deserve notice: first, they are intensely religious; second, they make no distinction between English and Welsh, as the earlier laws had done.

The millenary of King Alfred was celebrated on September 18, 1901, at Winchester, the former capital of the Anglo-Saxon kingdom. The commemorative exercises were participated in by many distinguished men from all English-speaking countries. On September 20, the day of the most important functions, all the delegates joined in a great procession and marched to the site where the colossal statue of Alfred, the work of Thornycroft, was unveiled, and the oration was delivered by Lord Rosebery.

In the United States the Society of American Authors encouraged the celebration of "the one thousandth anniversary of the founder of the Anglo-Saxon race." Exercises were held on October 28 in libraries and schools in various cities. The chief celebration was in New York City, where Alfred Bowker, the Mayor of Winchester, was the guest of honor.

The great contemporary sources of information for Alfred's life are Asser's *Life of Alfred* and the *Anglo-Saxon Chronicle*. Of each of these there are several editions in the original Latin; translations can be found in the Bohn Library; in Stevenson's *Church Historians of England*, and elsewhere. The genuineness of Asser's work has been the subject of much controversy, but most scholars now believe it to be a contemporary work, with some later interpolations. Of secondary works Pauli's *König Alfred*, edited by Thomas Wright, is still deserving of mention.

BIBLIOGRAPHY. The constitutional events of the reign are described in Stubbs, *Constitutional History*, Volume I. (Oxford, 1891). The millenary celebration caused the production of many books and articles. Of these the following may be mentioned: Bowker, *Alfred the Great* (London, 1899), which contains seven special studies by Sir Walter Besant, Sir Frederick Pollock, Frederic Harrison, and others; Conybeare, *Alfred in the Chroniclers* (London, 1900); Draper, *Alfred the Great* (London, 1901); Harrison, *Writings of King Alfred* (New York, 1901); Hughes, *Alfred the Great*, new edition (London, 1901); Jeffery, *A Perfect Prince, The Story of the England of Alfred the Great* (London, 1901); Macfayden, *Alfred the West Saxon* (London, 1901); Wall, *Alfred the Great, His Abbeys of Hyde, Athelney, and Shaftesbury* (London, 1900). Frederic Perry is preparing a volume, *Alfred the Truth Teller*, for the Heroes of the Nations Series. Mr. Slade, of the Library of Congress, has prepared a bibliography of Alfred, which aims at completeness.

ALFRED OF BEV′ERLEY (born c.1100). An old English chronicler, about whom little is known. He describes himself as treasurer and sacrist of the church of Beverley, in Yorkshire, where he wrote in Latin a chronicle history of Britain, from the fabulous period down to 1129, called the *Annales* (in 9 books). It is mostly a compilation. An inferior MS. was printed by T. Hearne (1716).

ALFRED U′NIVER′SITY. An American university, situated at Alfred, N. Y. It was organized as a school in 1836 and as a university in 1857. Its total endowment, including equipment, etc., was in 1906 about $500,000. The library has 13,000 volumes. The university has collegiate, industrial mechanics, fine arts, music, theological and preparatory departments, and a State school of clay working and ceramics. Instructors (1906) 26, students 300. President, Rev. B. C. Davis, Ph.D.

ALFRETON, ăl′fẽr-ton. A market town of Derbyshire, England, about 12 miles north of Derby (Map: England, E 3). Its foundation is ascribed to Alfred the Great. It has of late become a flourishing manufacturing town. Among its industries are pottery works, collieries, and iron foundries. Pop., 1891, 15,400; 1901, 17,500.

ALFURESE, ăl′fo͞o-rēz′ *or* ăl′fo͞o-rēs′, **ALFURU,** ȧl-fo͞o′ro͞o, or **ALFORA,** ȧl-fō′rȧ (Ar. *al*, the + Portug. *fora*, outside, thus probably meaning the outsiders). In Celebes, the Moluccas, etc., a term applied to the tribes, of the interior especially, who seem to differ from the more or less prevalent Malay type, being perhaps pre-Malay aboriginals. The name can hardly have, however, any strict anthropological connotation. In Celebes the Alfurese are found chiefly in the north, in Gilolo in the central regions, while in Ceram they are the predominant race. The Alfurese of Celebes are probably not so different from the Malayans as has hitherto been believed, being a mixed race. The Alfurese of Gilolo were considered by Wallace the true aborigines of the island, and those of Ceram, etc., to be of Papuan stock at bottom. There are, evidently, several kinds of Alfurese (the word has somewhat the sense of our "gentile," "pagan"), some Malays doubtless, others pre-Malay, still others of Papuan affinities. See CELEBES; MOLUCCAS.

ALGÆ, ăl′jē (Lat. nom. pl. of *alga*, seaweed). A group of chlorophyll-bearing or colored thallophytes containing the lowest forms of plant life. The algæ are contrasted with the fungi, which latter are devoid of chlorophyll. There is an obvious relationship between the algæ and the fungi (q.v.), the latter probably having been derived from the former. Consequently, a perfectly natural classification should combine both groups; but botanists are hardly ready at this time to attempt so difficult a problem. Although the fungi have come from algal ancestry, they have undoubtedly been derived from two or more widely separated regions of the algæ. Thus, the Bacteria (*Schizomycetes*) have probably come from the lowly Blue-green Algæ (*Cyanophyceæ*), while the Phycomycetes (molds of various kinds) have their origin from much higher levels. It follows, therefore, that the Fungi contain several groups with no generic relation except through a roundabout algal ancestry. Consequently the division of the Thallophytes into the Algæ and Fungi is largely a classification of convenience, based upon the physiological character of the presence or absence of chlorophyll (green pigment) or of pigments related to chlorophyll.

CLASSIFICATION. The Algæ are readily divided into four groups, which have the rank of classes: viz., the Blue-green Algæ (*Cyanophyceæ*), Green Algæ (*Chlorophyceæ*), Brown Algæ (*Phæophyceæ*), and Red Algæ (*Rhodophyceæ*). Under the scientific names there will be found accounts of their general habits and most striking characteristics. From the names of these classes one might imagine that the groups are distinguished by color marks; but in reality fundamental morphological characters form the basis of the classification. Although it is convenient to think of the Algæ as distinguished by their color, there are many exceptions to the rule, and color should never be regarded as the foundation of the classification.

CYANOPHYCEÆ. Blue-green Algæ are remarkable for the simplicity of their cell structure. There are probably never present distinct cell organs (nucleus, etc.), the blue-green pigment being diffused through the outer regions of the protoplasm. It is this extreme simplicity of cell structure that seems to unite these Algæ with the Bacteria. In addition to the vegetative cells, there are in the filamentous forms peculiar empty cells called Heterocysts (q.v.), which have an important relation to the method of growth termed "false branching." (See CYANOPHYCEÆ.) At the approach of an unfavorable season, as cold or drought, certain cells take on thick walls, becoming reproductive cells or spores. There is no method of sexual reproduction. The Cyanophyceæ comprise two orders: the Coccogonales, containing the unicellular forms, and the Hormogonales, which comprise the filamentous types. The latter order takes its name from the peculiar method of vegetative reproduction, whereby the filaments break up into segments called hormogonia, which separate and develop new plants.

CHLOROPHYCEÆ. The Green Algæ form a large assemblage, varying from unicellular forms of very simple life history to groups with highly differentiated vegetative structure and methods of sexual reproduction. It is perhaps the best group of plants for illustration of the steps and conditions of the evolution of sex. Sexual cells or Gametes (q.v.) are unquestionably derived from the asexual reproductive cells called zoöspores or swarm spores, which are the commonest reproductive elements in the Chlorophyceæ. The zoöspores, after taking on sexual characters, are further differentiated into large non-motile eggs and the highly specialized sperms. One may find in the Chlorophyceæ various stages in this process of sexual differentiation, and it is interesting to note that sex has arisen in several groups independently of one another. Furthermore, the production by many Algæ of asexual spores on the one hand, or sexual cells (gametes) on the other, is known to be determined by environmental factors, such as heat, light, and the character of the food. The same plant may be made to produce in succession non-sexual reproductive cells, or sexual elements, by merely modifying the life conditions. The most conspicuous groups of the Chlorophyceæ which may be ranked as orders are the Protococcales, Confervales, Conjugales, Diatomales, Siphonales, and Charales.

The Protococcales include unicellular forms and the cell-colonies called Cœnobia (q.v.), there being several divergent lines of development. One of the simpler types is Pleurococcus, which grows thickly upon the north side of trees. This plant, contrary to many statements, never develops spores, and reproduces entirely by cell-division. It should not be confused with Protococcus (or Chlorococcus), a much rarer form, far more complicated in structure and life history. The Protococcales are believed to represent the starting point of the main line of ascent which runs through the Confervales to the Bryophytes (liverworts and mosses). There are also represented in this group several other well-marked lines, which, however, ending blindly, bear no relation to other plants. The development of these lines is determined by the degree of emphasis that is laid upon certain phases of the varied life history of the Protococcales. Thus, the Volvocaceæ have developed especially the motile condition; the Hydrodictyaceæ, the colony (cœnobium) condition; and the Pleurococcaceæ, the life of vegetative cells, reproducing by simple division.

The Confervales comprise the many-celled filamentous and membranous forms that are nearest to the theoretical main line of ascent to the Bryophytes (liverworts and mosses). The simpler types, such as Ulothrix and Ulva, have similar swimming sexual cells (gametes), which fuse (conjugate) in pairs in the water. Higher members, as Œdogonium and Coleochæte, have distinct eggs and sperms, but there are certain forms which present intermediate conditions that show clearly that the sexual differentiation of the highest types (heterogamy) has developed from the simplicity illustrated by Ulothrix, whose gametes cannot be distinguished (isogamy). In Coleochæte there is the further complication of Alternation of generations (q.v.). The fertilized egg, instead of developing directly into a new Coleochæte plant, forms a small body (sporophyte) which contains spores, each of which produces a new sexual Coleochæte plant (gametophyte). The appearance of this sexless generation in Coleochæte is strikingly like the sporophyte of the simpler liverworts.

The Conjugales, or Pond Scums (see CHLOROPHYCEÆ), are peculiar by reason of the sexually formed spore that results from the union of non-motile cells whose contents fuse directly, never presenting a free swimming condition. The order contains such well-known filamentous forms as Spirogyra and Zygnema, and the large group of the Desmids, the latter mostly unicellular. The Conjugales are chiefly remarkable for the extreme beauty of their cell contents, the green color body being especially well developed. They are not closely related to any other group of Algæ, and their origin is problematical. The method of sexual reproduction is unique, having little resemblance in manner and form to the sexual processes of other Chlorophyceæ.

The Diatomales, or Diatomaceæ (q.v.), have an uncertain position, but show certain affinities to the Desmids. Their color body is generally brown, but is green in some species. The Siphonales form a large group, chiefly marine. Certain members (e.g., Caulerpa) have a high grade of vegetative organization, presenting a stem-like axis that bears leaf-like expanded lateral outgrowths, and in addition colorless root-like processes (rhizoids) which grow into the substratum. The commonest illustration is Vaucheria, the only member of the order with distinct eggs and sperms (heterogamy, q.v.). The vegetative body of the Siphonales, however complex, has no partitions, but is a continuous tube or system of branching tubes through which the protoplasm slowly circulates. Such a structure is called Cœnocyte (q.v.). Another interesting genus is Botrydium, which has the form of a green, swollen bladder about the size of a pinhead, and is attached to moist soil by a system of branching root-like filaments. Botrydium and Vaucheria are practically the only terrestrial or fresh water representatives of this order.

The Charales form the highest group of the Chlorophyceæ in respect to vegetative structure. The forms are remarkable for the symmetry of their parts, a condition which results from a well-defined method and order of growth. The growth is dominated by a terminal cell, whose divisions determine with mathematical regularity the position and structure of the nodes (joints) and internodes. The system of growth is even followed in the development of the leaf-like branches, ordinary branches, and in the development of the female sex organ (oögonium). The sexual organs are complex, especially the male organ (antheridium), which develops thousands of sperms. The eggs are large and are protected by a set of enveloping filaments, the whole constituting a complex female organ.

PHÆOPHYCEÆ. The Brown Algæ also form a very large group, which contains diverse lines of development, the forms ranging from simple filaments to the gigantic Kelp or Devil's Apron (q.v.), and highly specialized rock weeds. This class also presents excellent illustrations of the principal stages in the evolution of sex. There are two sub-classes: the Phæosporeæ, whose reproductive cells, whether sexual or asexual, are swimming spores, and the Cyclosporeæ, whose reproductive cells are large eggs fertilized by highly specialized sperms. The motile reproductive cells of the group, whether sexless spores or gametes (sexual cells), are peculiar in being bean- or kidney-shaped, with the pair of cilia inserted laterally. There are a dozen or more orders in this group, the largest being the Ectocarpales, comprising some of the simplest filamentous forms; the Laminariales or kelps, and the Fucales, which include the rock weeds and Sargassum. In vegetative complexity some of the Fucales are probably the highest of all the Algæ. For illustration see PHÆOPHYCEÆ.

RHODOPHYCEÆ. The Red Algæ are acknowledged to be the most beautiful of all the Algæ, because of the delicacy of their structure and brilliancy of color. The vegetative structure is not so highly differentiated as in some of the Brown and Green Algæ, but the method of sexual reproduction is especially complex. As the result of the fertilization of the female cell by the fusion of a sperm with the Trichogyne (a hair-like process of the female cell, q.v.), there arises a growth of filaments constituting a new generation (sporophyte), which remains attached to the parent plant. The filaments of this sporophyte sometimes establish secondary connections with the sexual plant (gametophyte) for purposes of nutrition. Certain cells of the sporophyte become spores (carpospores). The masses of spores constitute the fruit, called a cystocarp, which frequently includes a highly developed receptacle formed from the tissue of the parent plant. The sperms of the Red Algæ are non-motile. There is an asexual method of reproduction by tetraspores, so called because they are generally formed in the mother-cell in groups of four. For illustration see HYDROPHYTES.

The Algæ furnish especially good illustrations of some biological phenomena of general interest. Perhaps the most remarkable are the physiological conditions surrounding the development of the reproductive cells. The commonest form of reproductive cell is the swimming spore, which became established very early in the development of the Algæ, as far back as the Protococcales, whose members frequently pass a considerable part of their life history in a motile condition, essentially like that of a swimming spore. Whenever a higher alga develops swimming spores, which generally happens at a certain period of its life history, it may be said to return to one of the conditions of its early ancestors. As has been mentioned before, the simple motile sex cells (gametes) which fuse in pairs in the water are unquestionably swimming spores endowed with sexual qualities, or, stated differently, lacking the power to develop independently into new plants. It has been thoroughly established by many experimental studies that these peculiarities are determined by environmental factors. As an example, almost all Hydrodictyon plants will produce sex cells after cultivation in a solution of cane sugar and under subdued light. Asexual spores will be developed by the same plants when cultivated in a nutrient salt solution with bright illumination. There are instances of parthenogenesis in almost all large groups of the Algæ, and the phenomenon is frequently related to seasonal and other environmental conditions. See PARTHENOGENESIS.

The presence of Algæ in reservoirs is often a source of much annoyance, as they render the water objectionable for use, if not a source of disease. Recent experiments have shown the possibility of speedily destroying these objectionable growths by treating the storage basin two or three times during the summer with copper sulphate in such amount as to give an extremely dilute solution. Fully 100 water supply reservoirs have been successfully treated without a single instance of injury being reported. Cress beds have been freed of Spirogyra by using 1 part of copper sulphate to 50,000,000 parts of water. For illustrations, see articles CHLOROPHYCEÆ; CYANOPHYCEÆ; PHÆOPHYCEÆ, and RHODOPHYCEÆ.

For general description of Algæ, consult: Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Berlin, 1899, et seq.); Murray, *Introduction to the Study of Seaweeds* (London, 1895); Farlow, *Marine Algæ of New England* (Salem, 1881); Cook, *British Fresh Water Algæ* (London, 1881-83); Kirchner, "Kryptogamen-flora von Schlesien," in *Schlesische Gesellschaft für vaterländische Kultur* (Breslau, 1876-89).

ALGARDI, äl-gär′dē, ALESSANDRO (1602-54). A prominent Italian sculptor and architect of the Baroque period. He was born at Bologna, where he first studied painting under the Carracci, but afterwards took up sculpture with Conventui. His style, however, was modelled upon Bernini's works at Rome, which was the principal seat of his activity. Like other sculptors of the Baroque style, of which he was, next to Bernini, the most prominent representative in Italy, he conceived sculpture in a pictorial sense. Though his works are of high technical ability, their effect is marred by a hollow pathos and exaggerated dramatic action. The most important are Saint Philip Neri in Bologna, the tomb of Leo XI. in Saint Peter's, Rome, and (in the same church) the largest alto-rilievo in the world, representing the retreat of Attila from

Rome. An architect of note, he designed the Villa Pamfili and the façade of Sant' Ignazio in Rome.

AL'GARO'BA. See Mesquite Tree.

ALGAROTTI, ä̆l'gȧ-rŏt'tē, Francesco, Count (1712-64). An Italian author. He was born in Venice, studied at Rome and Bologna, and when twenty-one years old published in Paris his *Neutonianismo per le donne* ("The Newtonian Philosophy for Ladies"), a work on optics, on which his reputation was founded. Until 1739 he lived in France, and for many years enjoyed the friendship of Voltaire. On his return from a journey to Russia he first met Frederick the Great, who bestowed upon him the title of count, and in 1747 made him court chamberlain. He also enjoyed the favor of Augustus III. of Poland, and lived alternately in Berlin and Dresden until his return to Italy in 1754. He died at Pisa, where Frederick the Great raised a monument to his memory in the Campo Santo. He was a versatile man and a voluminous writer. In his day he was considered a good judge of painting and architecture, and his reputation is confirmed by his *Saggi sopra le belle arti* ("Essays on the Fine Arts"), and by the paintings he selected for the Dresden Gallery. His chief defect of style was the strong Gallic flavoring, due to a too faithful study of French literature. English readers are most likely to think of him as Carlyle's "young Venetian gentleman of elegance in dusky skin and very white linen." Algarotti's collected works appeared, with biography by D. Michelessi, Venice, 1791-94.

ALGAROVILLA, ă̈l'gȧ-rō-vēl'yȧ (Sp. *algarroba*, from Ar. *al-kharrubah*, the carob tree). An astringent product of the *Juga marthæ*, an acacia growing in Colombia, the pods of which are said to be four times as rich in tannin as the best oak bark. Black ink is made from it; also a yellow dye; and it is useful in medicine.

ALGARVE, ȧl-gär'vȧ. The smallest and most southerly of the provinces of Portugal, situated between Andalusia and the Atlantic Ocean (Map: Portugal, A 4). Its area is 1873 square miles. The northern part of the province is occupied by a range of mountains of an average height of 4000 feet, which form the continuation of the Sierra Morena of Spain, and terminate in Cape St. Vincent, the south-western extremity of Europe. The highest ridges are destitute of vegetation, and the mountainous regions are but little adapted for agricultural purposes. From the main ridge the country slopes southward in jagged terraces and low hills, leaving a level tract of a few miles along the coast. The African heat of the climate is mitigated by the cool sea breeze. The only river of importance is the Guadiana, on the frontiers of Spain. The soil of the plain is but indifferently suited for the production of grain, or even for pasturage; but it produces many kinds of southern fruit, including figs, almonds, olives, and grapes. The mineral wealth is considerable, but its exploitation is insignificant. The principal occupations of the inhabitants are agriculture, fishing, and the production of sea salt. Population, 1900, 255,191. The inhabitants have preserved many of the characteristics of the Moors. The chief town is Faro. In ancient times it was much more extensive. It received its name from the Arabs, in whose language Algarve signifies "a land lying to the west." It was a Moorish province till 1253, when Alfonso III. united it to the crown of Portugal as a separate kingdom.

AL-GAZALI, ä̆l'gȧ-zä'lē, or **AL-GAZEL**, ä̆l'gȧ-zĕl', Abu Hamid Mohammed (1058-1111). A celebrated Arabian theologian and philosopher, born at Tun, in the province of Khorassan, in eastern Persia. He became a leader of the school of the Ascharites, or Orthodox, and was for a time professor of theology in the university at Bagdad. Subsequently he assumed the rule of the Sufis (see Sufiism), or Mystics, and thus for the most part continued until his death. His eloquence as a lecturer won for him the title of *Zeïn-ed-Dîn*, or "Ornament of Religion," and his *Revivification of the Sciences of Religion* was so highly esteemed by Mussulmans that the saying arose that if only this work were preserved the loss of all the rest of Islam would be but slight. He wrote also *The Destruction of the Philosophers*, in refutation of the ancient philosophic doctrine. He was severely attacked by Averroës (q.v.).

AL'GAZEL (*Al* is the Ar. article *the*). A gazelle; ordinarily the dorcas. See Gazelle.

AL'GEBRA. A branch of pure mathematics that materially simplifies the solution of arithmetical problems, especially through the use of equations. It also forms the introduction to all of the higher branches of mathematical science, except pure geometry.

The name is derived from the title of the Arabic work by Al-Khuwarizmi (q.v.), *Ilm al-jabr wa'l muqabalah*, meaning "the science of redintegration and equation;" that is, the science that relates to the reduction of equations to integral form and to the transposition of terms. The title appeared thereafter in various forms, as *ludus algebræ almugrabalæque*, and *algiebar* and *almachabel*, but the abbreviation algebra was finally adopted. The science also went under various other names in the fifteenth and sixteenth centuries, as the *ars magna* (Cardan, 1545), the *arte maggiore*, the *regola de la cosa* (because the unknown quantity was denominated *cosa*, the "thing"), and hence in early English the *cossike art*, and in German the *Coss*.

The exact limitations of algebra are not generally agreed upon by mathematicians, and hence various definitions have been proposed for the science. It has been proposed to limit it to the theory of equations, as the etymology of the word would suggest; but this has become a separate branch of mathematics. Perhaps the most satisfactory definition, especially as it brings out the distinction between algebra and arithmetic, is that of Comte: "Algebra is the calculus of functions, and arithmetic is the calculus of values." This distinction would include some arithmetic in ordinary school algebra (e. g., the study of surds), and some algebra in common arithmetic (e.g., the formula for square root).

The oldest known manuscript in which algebra is treated is that of Ahmes, the Egyptian scribe, who, about 1700 B.C., copied a treatise dating perhaps from 2500 B.C. In this appears the simple equation in the form, "Hau (literally heap), its seventh, its whole, it makes 19," which, put in modern symbols, means $\frac{x}{7} + x = 19$. In Euclid's *Elements* (about 300 B.C.) a knowledge of certain quadratic equations is shown. It was Diophantus of Alexandria (q.v.), however, who made the first attempt (fourth century A.D.) to work out the science. In the following century Aryabhatta (q.v.) made some contributions to the subject. Little was then done until about 800 A.D., when Al-Khuwarizmi wrote. His efforts were followed by another period of comparative repose, until the Italian algebraists of the sixteenth century undertook the solution of the cubic equation. (See EQUATION.) In this, building upon the efforts of Ferreo and Tartaglia, Cardan was successful (1545), although there is reason to believe that the real honor belongs to Tartaglia. Soon after, Ferrari and Bombelli (1579) gave the solution of the biquadratic equation.

The principal improvements in the succeeding century related to symbolism. It took a long time, however, to pass from the radical sign of Chuquet (1484), ℞^{4}. 10 through various forms, as $\sqrt{\mathfrak{zz}}\ 10$, to our common symbol $\sqrt[4]{10}$ and to the more refined $10^{\frac{1}{4}}$. Similarly it was only by slow steps that progress was made from Cardan's cubus p 6 rebus æqualis 20, for $x^3 + 6x = 20$, through Vieta's

$$1C - 8Q + 16N \textit{ æqu. } 40, \text{ for } x^3 - 8x^2 + 16x = 40$$

and Descartes'

$$x^3 \propto ax - bb, \text{ for } x^2 = ax - b^2,$$

and Hudde's

$$x \propto qx.\ r, \text{ for } x^3 = qx + r.$$

to the modern notation. To the Frenchman Vieta, whose first book on algebra, *In Artem Analyticam Isagoge*, appeared in 1591, credit is due for the introduction of the use of letters to represent known as well as unknown quantities.

The next step led to the recognition of the nature of the various number systems of algebra. The meaning of the negative number began to be really appreciated through the application of algebra to geometry by Descartes (1637), and the meaning of the so-called "imaginary," when Wessel (1797) published his memoir on complex numbers, or, more strictly, when Gauss (q.v.) brought the matter to the attention of mathematicians (1832).

The effort to solve the quintic equation, seriously begun in the sixteenth century, had met with failure. It was only after the opening of the nineteenth century that Abel, by the use of the theory of groups discovered by Galois, gave the first satisfactory proof of the fact, anticipated by Gauss and announced by Ruffini, that it is impossible to express the roots of a general equation as algebraic functions of the coefficients when the degree exceeds the fourth.

Among the later additions to the science of algebra may be mentioned the subjects of Determinants (q.v.), Complex Number (q.v.), Substitutions and Groups (q.v.), Form, and the modern treatment of Equation (q.v.). Under these heads may be found historical sketches dealing with the recent developments of algebra.

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AL'GEBRA'IC CURVE. See CURVE.

ALGECIRAS, ăl'jė-sī'ras, *Sp. pron.* äl'ʜä-thĕ'räs (From Ar. *al-jazīrah*, the island, peninsula). A seaport of Spain, in the province of Cadiz, six miles west of Gibraltar (Map: Spain, C 4). Its harbor is good, and protected by a fort. It is a well-built city, with fine churches and monasteries. It maintains a brisk and profitable coasting trade. Pop., 1900, 13,131. This was the Pontus Novus of Roman times, and later was the first place seized by the Moors from Africa (711). They called it Algeciras, the green island, from the islet at the harbor's mouth, still known as Isla Verde. Alfonso XI. besieged it for twenty months, and took it after his victory at Rio Salado, 1344. The Moors are said to have used gunpowder for the first time at this siege, at which all Christendom was represented by knights and crusaders. An international conference for the regulation of Moroccan affairs assembled at Algeciras in January, 1906. See MOROCCO.

AL'GER, HORATIO (1834-99). An American writer of juvenile literature. He was born at Revere, Mass., graduated at Harvard in 1852, and afterward at the Harvard Divinity School. He became pastor of the Unitarian church at Brewster, Mass., in 1864, but two years later went to New York, where he labored for the improvement of the condition of street boys. He wrote much for newspapers and periodicals, and published about seventy books, of which nearly 800,000 copies have been sold. These writings include the popular Ragged Dick, Tattered Tom, and Luck and Pluck series.

ALGER, RUSSELL ALEXANDER (1836—). An American soldier and politician, born in Lafayette, Ohio. He studied law at Akron, Ohio, was admitted to the bar in 1859, and began practice at Cleveland. He removed to Michigan in January, 1860, and in September, 1861, enlisted in the Union Army as a volunteer, serving successively as captain, major, and lieutenant-colonel, and being brevetted first as brigadier-general and then as major-general "for gallant and meritorious services." He returned to Michigan in 1864, where he amassed a large fortune in the lumber business. He took an active interest in both local and national politics, and was Governor of Michigan from 1885 to 1886. He became Commander-in-Chief of the G. A. R. in 1889, and in 1897 became Secretary of War in President McKinley's cabinet. His administration of the department during the Spanish-American War met with the most vigorous criticism. He was charged with being directly or indirectly responsible for the unsanitary condition of camps, the overcrowding and unfitness of transports, the insufficiency of physicians and medicines, the bad quality of food, and the incompetence of subordinate officers. An investigating committee, appointed by the President, in the main exonerated Alger. He resigned August 1, 1899. In 1902 he was appointed to the United States Senate, and in 1903 was elected to that body. He wrote *The Spanish-American War* (New York, 1901).

ALGER, WILLIAM ROUNSEVILLE (1822-1905).

An American Unitarian clergyman and ethical writer, born at Freetown, Mass., December 30, 1822. He graduated at the Harvard Theological School in 1847, held pastorates successively at Roxbury, Boston, New York, Denver, Chicago, and Portland, Me., and afterward lived in Boston. He wrote *Poetry of the Orient* (1856), *History of the Doctrine of a Future Life*, which contains a remarkable bibliography on the subject by Ezra Abbot (1863), *The Genius of Solitude* (1865), *Life of Edwin Forrest*, 2 volumes (1878), *Symbolic History of the Cross* (1881), and *The School of Life* (1881).

ALGE'RIA (Ar. *Al-jazirah*, the island; Fr. *Algérie*). A French colony in north Africa, situated between lat. 30° and 37° N. and long. 2° 10′ W. and 8° 50′ E. (Map: Africa, E 1). It is about 550 miles long from east to west, and extends inland from 320 to 380 miles. Its area, exclusive of the Algerian Sahara, is estimated at 184,930 square miles, and inclusive of the Sahara region, at about 316,630. Its boundaries are formed by the Mediterranean on the north, Morocco on the west, Sahara on the south, and Tunis on the east.

Physiography. The entire northern part is traversed by a section of the Atlas Mountains, which cover the northern part of Africa from the Atlantic to the Gulf of Gabes. The mountain system of Algeria may be divided into two principal chains, running parallel to each other and connected by small ridges. The northern chain, called Little or Maritime Atlas, runs along the coast. Of its several ranges, the Jurjura, to the east of Algiers, rises to a height of about 7500 feet. The Great Atlas is situated south of the Little Atlas, and contains some of the highest peaks of Algeria, as Mount Shelia (about 7600 feet) in the Jebel Aures. This range presents a steep wall toward the Sahara, but slopes more gradually on their northern side, where the mountains are covered with extensive forests. They are furrowed by deep and tortuous defiles. The Algerian Sahara is a rocky plateau, with an average elevation of about 1500 feet. Some geographers distinguish a third chain, the Sahara Border Range, situated between the Great Atlas and the Sahara Desert. The coast of Algeria is much broken, and forms numerous bays, the principal among them being the Bay of Algiers and the gulfs of Bougie and Bona.

The surface of Algeria represents three natural divisions or zones. The first, known as the Tell, is the most northern part of the country, extending inland for about fifty miles, and taking in the northern slope of the Little Atlas. It is the most productive and best watered part of the country, and contains most of the European settlements. The second, central zone includes the elevated steppes south of the Tell and the Great Atlas Mountains. It is interspersed with numerous saline lakes or *shotts*, which generally evaporate during the dry season, leaving a thick stratum of salt on the bottom. In this section there are only a few little streams, which dry up for a part of the year. The third zone is the Algerian Sahara, with an area estimated at upward of 100,000 square miles. It is subdivided into three parts, called Fiafi, Kifar, and Falat, respectively. The first term is generally applied to the oases of the desert. They are mostly well watered and covered with vegetation, and contain numerous thriving villages and settlements. The second refers to those parts of the desert which are covered with grass part of the year. They have no settled population, but are visited by the nomadic tribes on account of the grass. The third part includes the rest of the desert, which is utterly devoid of vegetation, and unfit for human habitation. A remarkable feature of the Algerian Sahara is the dried up river courses. At present, only two such courses are known, called the Wady Igharghar and Wady Miya, respectively. The first begins south of Algerian Sahara and runs due north, terminating at the Shott Melghir. Its length is over 700 miles, and its breadth, even at present, is about four miles in some parts. The Wady Miya is a branch of Igharghar, which it joins about 60 miles south of Shott Melghir. There is still some water running beneath its bottom.

Algeria is rich in minerals. Among the metals which are obtained are iron, lead, copper, and quicksilver. Sulphur is found, and there are valuable deposits of phosphates. Salt is a most important product. Onyx and beautiful white and red marbles are quarried.

The most important river of Algeria is the Sheliff, which has in the main a westerly course, and empties into the Mediterranean near Mostaganem. Its length is about 400 miles. Among other streams are the Seybouse, which empties into the Gulf of Bona, the Wady el Kebir, which flows past Constantine, and the Tafna in the extreme west. None of these rivers is navigable, but they all contribute considerably to the fertility of the regions through which they flow.

The climate of Algeria is generally healthful, except in the marshy lowlands. The rainy season on the coast lands lasts from October to March.

The mountain forests are filled with cedars and different kinds of oak, as well as pines, ashes, junipers, aloes, dwarf palms, and cactuses, but they are rapidly disappearing, giving place to pastures. The flora of the central zone is confined mainly to grasses and some aromatic herbs. Myrtles, olives, pistachias, and dwarf palms are among the characteristic plants of the northern zone. The fauna of Algeria is generally African in its character. The lion (now getting scarce) and other large carnivora are found, and gazelles are numerous.

Products. Algeria is chiefly an agricultural country, and its importance is increasing. In 1904 the total agricultural population of the colony was given as 3,505,640, of whom 201,032 were Europeans, mostly Frenchmen. The greater part of the area under cultivation is devoted to grain crops. The average annual output of cereals amounts to over 6,000,000 quintals of wheat, from 7,000,000 to 8,000,000 quintals of barley, and about 7,000,000 quintals of oats. (The *quintal* = 220.46 pounds.) In 1902 vines covered 160,792 hectares, yielding 7,000,000 hectolitres of wine in 1905. The cultivation of silk, olives, dates, and other fruits is also becoming important, and is participated in to a considerable extent by Europeans. Potatoes, carrots, onions, and asparagus constitute important articles of export. Alfa grass is exported in large quantities to England. The forest area is estimated at about 2,800,000 hectares, of which over 70 per cent. belongs to the state. The exploitation of the forests is considerably hindered by their inaccessibility, a large part of them being situated in uninhabitable regions. Considerable attention is given to mining, which is carried on chiefly by English firms. Among other industries may be mentioned pottery, leather dressing, weaving, and the production of esparto goods.

The commerce of Algeria is constantly on the increase, the total value having amounted to over $122,530,000 (imports, $76,777,000; exports, $45,753,000) for 1905, against about $104,220,000 for 1895, an increase of almost 18 per cent. in eleven years. By far the most important article of export is wine, of which France alone imports annually about $20,000,000 worth. Next to wine the most important exports are cereals, live animals, alfa, cork, and mineral ores. Imports consist chiefly of textiles, clothing, furniture, machinery, coffee, tobacco, timber, and coal. The bulk of the commerce is with France and her colonies, the imports from which amounted in 1905 to $66,969,000, and the exports, $35,527,000. Outside of France the commercial relations of Algeria are chiefly with Great Britain, Spain, Italy, and Brazil. The total length of the railway lines of Algeria was 1950 miles in 1905. Algeria has, besides, a good system of national roads, and about 100 miles of tramway lines. The entries and clearings at the Algerian ports in 1904 amounted to 6,647,000 tons, mostly in French bottoms.

The administration of Algeria is vested in a Governor-General, who is assisted by a council. Under the law of Dec. 2, 1902, the Governor-Generalship of Algeria was divided into two parts, Algeria proper, and the Southern Territories, with separate administrations and budgets but under one Governor-General. The Southern Territories were constituted out of portions of Algeria and the Sahara. Under this new arrangement Algeria proper contains 77,208 square miles, with a population in 1901 of 4,441,515, and the Southern Territories contain 316,629 square miles, with a population in 1901 of 359,960. All the laws for Algeria are framed by the French National Assembly. A part of the territory is still under military rule, supervised by the Governor. The three departments of Algiers, Oran, and Constantine, into which Algeria is divided, have their own councils, who send delegates to the Superior Council, meeting once a year for the purpose of discussing the budget. Each department sends one senator and two deputies to the National Assembly. Justice is administered by courts of first instance, of which there are sixteen, justices of the peace, commercial courts, and a Court of Appeals, situated at Algiers. Criminal justice is organized on the same basis as in France. For the transaction of affairs between the natives and the Europeans or the government, there are organized so-called *Bureaux Arabes*, which also supervise the religious affairs of the natives. The military forces of Algeria number about 56,000 men, and consist of the Nineteenth Army Corps and the Territorial Army. The financial system of Algeria closely resembles that of France. The revenue is obtained from customs, monopolies, and direct taxes, the latter being the only tax paid by the natives. The budget of Algeria proper for 1906 nearly balanced at 95,500,000 francs; that of the Southern Territories at 3,150,000 francs. The military expenditure is borne by the French budget. By the law promulgated December 19, 1900, Algeria has been granted financial independence, its budget being excluded from that of France, and it has been endowed with the power of granting railway franchises, awarding public contracts, etc. Education and religion are supported by the State. The elementary schools, of which there were 1682 in 1904, are either French or Arabic, and are attended chiefly by foreigners and Jews, the Mussulman children forming only about 19 per cent. of the total attendance. The latter have their own schools for secondary education. Lycées are found in the larger cities, and there are nine commercial schools in the city of Algiers, as well as an institution for higher instruction with several faculties. All religions represented were subsidized until the enactment of the Separation Law in 1905, the total amount of grants for religious purposes in the budget for 1904 amounting to 1,008,300 francs. The population of Algeria, according to the census of 1901, was 4,801,475, against 3,817,000 in 1886 (not including the military). The native population, numbering 4,072,080, consists chiefly of Berbers, or Kabyles, and Arabs. The former number about 2,000,000, and are the original inhabitants of the land. They have a higher standard of morality than the Arabs; they are Mussulmans, but do not practice polygamy. At the invasion of the Arabs they were driven into the mountains and the oases, where they established well-populated settlements. The Arabs number over 1,000,000, and are to a considerable extent intermixed with the Berbers. They inhabit chiefly the Tell region and the towns. Part of them are organized in tribes, under chiefs who are not recognized, however, by the French Government. In religion they are Mohammedan, and practice polygamy. The nomadic part of the Arab population, among whom the tribal system is chiefly developed, hold their land in common, each tribe being entitled to a certain territory by virtue of tradition. The foreign population in 1901 numbered 596,997, of whom 60 per cent. were French, as compared with 422,000, of whom 51 per cent. were French, in 1886. The foreign population increased from 3,228 in 1831 to 131,283 in 1851, 245,117 in 1872, and 374.000 in 1881. The number of Jews was 57,132 in 1901. Negroes and Turks are found only in very small numbers. The capital, Algiers, had a population of 96,542 in 1901.

History. In ancient times the Numidians occupied Eastern and the Moors (or Mauri) Western Algeria. Under the Romans the former possessed the province of Numidia, the latter that of Mauretania Cæsariensis. Like all of northern Africa, these provinces enjoyed a high degree of prosperity and civilization under Roman sway, which was checked by the Vandal conquest about 440 A.D. The settlement of Arabic immigrants in the country after the Mohammedan conquest in the seventh and eighth centuries reared an Oriental civilization in place of that of Rome, and Arab princes ruled the land until the rise of the Almohades (q.v.), who governed until 1269, after which the country was split up into small states. After the expulsion of the Moors from Spain in 1492, they settled in Algeria, and began that career of piracy against the Christian nations which gave the country its evil reputation through many centuries. Hard pressed by Spain, one of the Algerine chiefs, the Emir of Metidja, called in the Turkish corsair Horuk, known as Barbarossa (q.v.), a renegade Greek, who turned against the Emir, and made himself Sultan of Algiers. He was overthrown by the Spaniards, and beheaded in 1518; but his brother, Khair-ed-Din, also known to the Christians as Barbarossa, succeeded him, repulsed the Spaniards with the assistance of a Turkish army, and established a military despotism sustained by piracy, which lasted until the French conquest. Khair-ed-Din placed the country under the suzerainty of the Turkish Sultan. The Emperor Charles V., in 1541, led a great expedition against this daring corsair, but met with disaster. In 1600 the soldiery of Algiers obtained from the Turkish Sultan the privilege of setting up an officer, called the Dey, who was to share the authority with the Turkish Pasha. The history of Algiers in the sixteenth and seventeenth centuries is a part of the history of the Barbary pirates, and of the fruitless efforts of the Christian powers to suppress them. Spanish, French, English, and Dutch were equally unsuccessful. Early in the eighteenth century the Dey Ali Baba effected the virtual emancipation of the country from the dominion of Constantinople. He banished the Turkish Pasha, who had heretofore represented the Sultan, persuaded the latter to leave the power solely in his hands, and paid no more tribute.

Algeria was now ruled by a military oligarchy, at the head of which stood the Dey, and after him the powerful Turkish militia, recruited from Constantinople and Smyrna. Besides these, there was a divan or Council of State, chosen from the sixty principal civil functionaries. The internal history of the country henceforth presents nothing but a bloody series of seraglio revolutions caused by the Janissaries, who permitted few of the deys to die a natural death. Algeria continued to defy the greater Christian powers, and to enforce tribute from the lesser. A final Spanish attack, made on a formidable scale in 1775, was as unfortunate as those that had preceded. During the French Revolution and the time of the Empire, its aggressions were much diminished, in consequence of the presence of powerful fleets in the Mediterranean Sea; but at the close of the Napoleonic wars they were recommenced vigorously. The first substantial rebuke was administered by a small United States squadron, commanded by the younger Decatur, which defeated an Algerine squadron off Cartagena, June 20, 1815, and compelled the Dey to acknowledge the inviolability of the American flag. About the same time, Admiral Lord Exmouth, with a strong English and Dutch fleet, bombarded the capital, and compelled the Dey to conclude a treaty (1816), by which all Christian slaves were released without ransom, and a promise was given that both piracy and Christian slavery should cease forever. The pledges were not kept. As early as 1817, Algerine pirates ventured as far as the North Sea, and seized all ships in their course not belonging to any of the Powers that sent them tribute, as was done by Sweden, Denmark, Portugal, Naples, Tuscany, and Sardinia. Treaties were of no avail. The Spanish, the Italian, and in particular the German shipping suffered severely. In 1817 the Dey Ali greatly curtailed the power of the Janissaries. His successor, Hussein, by his rash conduct, brought on the conflict with France, which broke the Moslem power in Algeria and made it a French province. In addition to the standing grievances against Algeria, there was a dispute regarding the payment of a debt incurred by the French Government to two Jewish merchants of Algiers at the time of the expedition to Egypt. This matter had long been pending in the French Courts, and as the Dey was a creditor of these Jews, he took a personal interest in the matter, and wrote to the King of France, who did not reply. At a reception of the consuls, he taxed the French consul with this, and when the latter replied that "a King of France could not condescend to correspond with a Dey of Algiers," Hussein angrily struck him.

This high crime against the dignity of nations brought the retribution which had not followed years of barbarous piracy. In 1830 the Dey and the Turks were expelled by a French fleet and a strong army under Bourmont. The excesses of the French soldiers awoke the resentment of the native population, who regarded all restraints as removed when their Turkish masters were driven out. For seventeen years the Arabs maintained a vigorous resistance to the French, and after them the Kabyles, the native population of the original Berber stock, still continued the struggle in a desultory manner. The drastic measures of the French military government did not tend to pacify the people, whose antagonism was inflamed by race hatred and religious fanaticism. For many years the French commanders were men trained in the Napoleonic school, such as Bourmont, Clausel, and Bugeaud; and meanwhile a new set of younger officers, like Changarnier and Cavaignac, who were to become known under the Second Empire, were trained in the severe school of Algerian service. Bourmont was succeeded by Clausel, Berthezène, and the Duke of Rovigo, all of whom failed to master the situation. Abd-el-Kader, a young Arab emir of marked abilities and dauntless spirit, had meanwhile brought together and organized the scattered forces of rebellion, and was secretly assisted by the Emperor of Morocco. A treaty was concluded with him during the provisional administration of General Voirol, and an attempt was made to promote the material interests of the country. Toward the end of 1834 there was an effort to organize the administration on a permanent civil basis, and General Drouet d'Erlon was made Governor-General, but a renewed outbreak by Abd-el-Kader led to his recall and that of the military commandant. Clausel, now a Marshal, was sent back to the Regency in 1835, but had to be reënforced by Bugeaud, who made a peace with the Arab chieftain, May 20, 1837, by which Abd-el-Kader recognized the sovereignty of France, but received in return several valuable provinces. In February, 1837, Damrémont succeeded Clausel as Governor-General, and after the former's death, at the storming of Constantine, General Valée was appointed to the difficult post. In October, 1839, Abd-el-Kader violated his last treaty on an insignificant pretext, and a general attack was made upon the French positions. Bugeaud supplanted Valée in 1841, and began an inexorable and unscrupulous campaign against the Arabs with an army augmented to nearly 100,000 men. Abd-el-Kader kept up a determined fight against odds until December, 1847, when he surrendered to General Lamoricière. (See ABD-EL-KADER.) An irregular warfare against French authority was then taken up by the Kabyles, thwarting for many years all attempts to establish civil government.

From 1858 to 1860 the military government of Algeria was superseded by the institution of a special ministerial department for Algeria and the colonies, which was first of all intrusted to Prince Napoleon. In December, 1860, however, a military government was reinstituted, and

Marshal Pélissier made Governor-General, with a vice-governor under him, a Director-General for civil affairs, and a Council of thirty members. In 1863, the Emperor Napoleon announced that he was willing to give the colony a new constitution, with a chamber of representatives for provincial affairs; he also addressed a letter to the Governor-General, in which he explained that Algeria was no colony in the strict sense of the word, but an Arab kingdom, and that the natives had the same right to protection as the colonists. In 1864, however, strife again arose between the colonists and the Arabs; and it was only after several engagements, during the months of April and May, that peace was restored by the submission of the conquered tribes. Pélissier having died in May, 1864, Marshal MacMahon was appointed to succeed him. In the following year, the Emperor himself made a journey to Algeria, and on March 5th issued a proclamation, in which, although explaining to the Arabs that the Regency must continue to be united to France, he promised to maintain their nationality, and at the same time gave them assurance that they should always remain in undisturbed possession of their territories. Yet these and other measures for conciliating the Arabs were all in vain; for, shortly after the Emperor's return to France, insurrections broke out in the province of Oran and elsewhere. In 1867 and 1868, a severe and general famine checked the military enterprises of the Arabs; and there was peace till 1870, when, owing to the Franco-Prussian War, the Emperor found it necessary to withdraw to Europe the greater part of the forces in Africa. MacMahon's place was then taken by General Durieu, as interim Governor-General, and the natives began to entertain hopes of freeing themselves from the yoke of France. The last serious rebellion was suppressed in 1871, and a civil government was then established. In 1881 France declared a protectorate over Tunis, in order to safeguard its interests in Algeria. Colonization was promoted after the Franco-Prussian War, by the offer of homes to those French Alsatians who did not care to remain under German rule. Algeria is now becoming a prosperous and valuable possession, and is strategically important as the base for the extension of French influence in Africa, especially across the Sahara to the Sudan and the west coast.

There is considerable literature relating to Algeria, that which is valuable being chiefly in French. For history, geography, and general description, consult: Gaffarel, *L'Algérie, histoire, conquête, colonisation* (Paris, 1883); Paul Leroy-Beaulieu, *L'Algérie et la Tunisie* (Paris, 1887); Battandier and Trabut, *L'Algérie* (Paris, 1898); Levasseur, *La France et ses colonies* (Paris, 1893); Cat, *Petite histoire de l'Algérie, Tunisie, Maroc* (Algiers, 1888-91); Rousset, *Les commencements d'une conquête; l'Algérie de 1830 à 1840* (Paris, 1887), and *La conquête de l'Algérie, 1841-1857* (Paris, 1889). English works that may be consulted are Wilkin, *Among the Berbers of Algeria* (New York, 1900); Morell, *Algeria* (London, 1854); Nugent, *A Land of Mosques and Marabouts* (London, 1894); Bridgman, *Winters in Algeria* (New York, 1890); Playfair, *The Scourge of Christendom* (London, 1884), a record of piratical Algiers, based mainly on consular archives; Cook, *Practical Guide to Algiers, Algeria, and Tunisia* (London, 1904); Watson, *The Voice of the South* (London, 1905); also a *Bibliography of Algeria*, published by the Royal Geographical Society, London, 1888.

ALGERINE WAR, ăl'jė-rēn'. See BARBARY POWERS, WARS WITH THE.

ALGHERO, ȧl-gā'rō, or **ALGHERI**, ȧl-gā'rē. An episcopal city on the northwest coast of Sardinia, 21 miles southwest of Sassari (Map: Italy, C 7). It is situated on a high, rocky shore, and the harbor is fortified. The cathedral dates from 1510; many of the houses are mediæval and the arsenal is fully equipped. The country produces wine, oil, indigo, and fruit, while from the sea come coral and shell-fish. The commerce has declined since the development of Porto Torres, the port of Sassari. Alghero is connected by fortnightly coasting steamers with the Italian peninsula and Cagliari; with the latter also by rail. West of the harbor are the beautiful grottoes of Neptune. In 1541 Charles V. landed at Alghero on his way to Africa, and spent several days in the Casa Albis, which is still pointed out to visitors.

ALGIERS, ăl-jērz' (Ar. *Al-jazā'ir*, the islands, referring to an island in its bay; Fr. *Alger*, ȧl'zhā', *formerly* ȧl'zhär'). The capital and chief seaport of Algeria, situated on the west shore of the Bay of Algiers, in lat. 36° 47' N., and long. 3° 3' E. (Map: Africa, E 1). It is located on the slope of the Sahel chain, the rich verdure of the mountains giving a beautiful background to the dazzling white of the city, which has the shape of a triangle, while over all towers the Moorish citadel or Kasbah, over 400 feet above the sea. Algiers is divided into two parts. The lower part is occupied by the modern city, which has been brought into existence by the French, and which differs in no respect from any well-appointed European city. It has wide and well shaded streets, spacious squares with statues and parks, and five municipal buildings, mostly located in the Boulevard de la République. The city is lighted by gas, and the water is supplied by four aqueducts, built in the beginning of the seventeenth century. In strong contrast to the European Algiers is the old Moorish part of the city, which rises above the former, and which, in all essentials, continues to be what it was during the reign of the Turkish Deys. The streets are narrow and crooked and often impassable for vehicles. The houses are very plain from the outside, but their interiors bear all the marks of splendor and beauty so characteristic of Moorish architecture. The roofs are flat, and in the evening become centres of gayety, and are even used occasionally for social functions. An additional picturesqueness is given to the Moorish part of the town by the motley crowds on its streets, including the elegantly dressed Frenchman, the splendidly arrayed Moor, as well as the scantily clad native from the interior. The mosques are less numerous than they were before the French occupation, when their number was estimated at about one hundred. At present there are only four mosques used as regular places of worship, but there are numbers of tombs of saints or "kubas," which are also used occasionally for that purpose. The citadel or Kasbah was constructed in the beginning of the sixteenth century, and was the scene of many attacks. At present it is used as barracks for the French soldiers, and many of its historical features have been entirely obliterated. The modern city has several splendid churches, including a Roman Catholic cathedral. Of educational institutions the city has schools of law, medicine, science, and letters, several lycées for the natives, as well as for Frenchmen, a number of commercial colleges and higher Mussulman schools. There are also a library and museum, two theatres, and a number of scientific societies. The harbor is very spacious and well fortified. The commerce of Algiers is very extensive, and its shipping amounts to nearly 7,000,000 tons annually. The commerce is chiefly with France; but there is also considerable export trade with Great Britain, Spain, Portugal, and Italy. Algiers is also one of the most important coaling stations on the Mediterranean. Owing to its mild climate and the fertile as well as picturesque country in which it is situated, Algiers is rapidly becoming a favorite health resort, and its transient population is steadily increasing. Algiers is connected by rail with Oran and Constantine, and communicates with France by steamer and cable. Since the French occupation, the growth of Algiers has been quite rapid. In 1838, it had a population of 30,000; 1881, 65,000; 1891, 83,000; 1896, 96,784, of which 40 per cent. were French, 24 per cent. Moors, and many Jews; 1901, 96,542 (with suburbs, 138,708). The percentage of natives is steadily declining, while the foreign population, especially the French, shows a steady increase. Algiers is the seat of the Governor-General and of the superior civil and military officials of Algeria and the department and arrondissement of Algiers. The city is supposed to have been founded in the first half of the tenth century, and fell into the hands of France in 1830.

ALGOA BAY, ăl-gō′ȧ. A large inlet at the southeastern extremity of Cape Colony (Map: Africa, G 8). It has a good harbor, and receives the Sunday and Baasher rivers. The bay is of considerable commercial importance, and is known in history as the landing place of the first British immigrants to South Africa. Port Elizabeth is situated on the western side of the bay.

ALGOL, ăl′gŏl (Ar. *al-ghūl*, the destroyer, demon). A remarkable variable star in the constellation Perseus. Its period is known with very great exactness, and amounts to 2 days, 20 hours, 48 minutes, and 55.4 seconds. This period is maintained with great regularity. Ordinarily the star is of the second magnitude; but it suffers periods of diminution, lasting four and one half hours, followed by constant minima of twenty minutes, and a return in three and one half hours to the original brilliancy. At minimum it is of the fourth magnitude, and gives only one-sixth as much light as it does in the maximum phase. Algol is the type of a class of variable stars whose minimum phase is very short. This phenomenon is ascribed to the temporary partial interposition of another star between Algol and the earth. There must be a comparatively non-luminous companion-star belonging to the Algol system; and mutual orbital revolution must bring this in line between Algol and the earth at regularly recurring intervals. That the visible Algol is actually subject to orbital motion, has become certain from the spectroscopic observations of Vogel (1889), who found that the visible star is receding from the earth about twenty-seven miles per second before the minima, and approaching us at about the same rate after the minima. His approximate estimate of the dimensions of the system assigns to the distance between Algol and the dark companion a value of 3,250,000 miles, and makes the diameters of the two bodies 840,000 and 1,060,000 miles. The orbit is supposed to be seen nearly edgewise from the earth. Chandler's suggestion that there exists still another invisible component rests upon less reliable evidence, derived from a study of the variations in Algol's position on the sky, as observed with meridian instruments by several successive generations of astronomers.

ALGOM′ETER. See PSYCHOLOGICAL APPARATUS.

ALGO′NA. A city and county seat of Kossuth Co., Iowa, 105 miles (direct) north by west of Des Moines, on the east fork of the Des Moines River, and on the Iowa Central, the Chicago and Northwestern, and the Chicago, Milwaukee and St. Paul railroads (Map: Iowa, C 1). It is the centre of an agricultural, dairying, and live stock region, and has manufactures of flour, butter tubs, foundry and machine shop products, planing mill products, bricks, tile, wagons, etc. The city contains a public library, opera house, and a handsome court house. Pop. 1890, 2068; 1900, 2911; 1905, 3047.

ALGON′KIAN SYS′TEM. In geology, that system, consisting chiefly of highly metamorphosed clastic rocks, that lies uncomformably between the Archæan beneath and the Cambrian above, and at the very bottom of the entire series of sedimentary rocks of the earth's crust. The name Algonkian was proposed by Walcott in 1889, and has been quite generally accepted by the more progressive American geologists. The rocks of this system consist of crystalline marbles, slates, schists, quartzites, conglomerates, and gneisses, all of which have, through more or less profound regional metamorphism, been derived from original sedimentary rocks, such as limestones, shales, and sandstones. In certain regions, particularly in the vicinity of the great lakes of North America, the Algonkian formations have undergone still further contact metamorphism through the intrusion of great masses of igneous rocks, and in this association occur some of the most important iron and copper deposits of the world. The known fossils of Algonkian age are very obscure and few in number. Because of the extensive metamorphism suffered by the rocks of both the Archæan and Algonkian systems, rendering, in many regions, their separation under the two divisions almost impossible, it is thought advisable to consider all rocks formed before the Cambrian period under the more comprehensive title PRE-CAMBRIAN FORMATIONS.

ALGON′QUIAN STOCK. The most widely extended and most important Indian linguistic stock of North America, formerly occupying nearly the whole area (with the exception of that occupied by the Iroquoian tribes) stretching from Labrador to the Rocky Mountains in the north, and extending southward to Pamlico Sound on the coast, and to the Cumberland River in the interior. It included several hundred tribes and sub-tribes speaking probably forty distinct languages, besides a large number of dialects. Both linguistic and traditional evidence point to the north Atlantic coast, from the St. John to the Delaware River, as the region from which the various cognate tribes migrated westward and southward. From the fact that the earliest settlements in Canada, New England, New York, New Jersey, and Virginia were all made within the Algonquian area, the history of these tribes is better known, and their languages have been more studied, than those of any others north of Mexico. For full two centuries they opposed the advance of the white man step by step, under such leaders as Opechancano, Philip, Pontiac, and Tecumseh, with the final and inevitable result of defeat, suppression, and swift decay. The number of the Algonquian stock (1902) is about 82,000 souls, of whom about 43,000 are in the United States, the remainder being in Canada, with the exception of a few hundred refugees in Mexico.

The principal Algonquian tribes were the Algonquin, Amalecite, Micmac, Nascopi, Cree, Abnaki, Pennacook, Massachuset, Wampanoag, Narraganset, Mohegan, Mahican, Montauk, Lenape or Delaware, Nanticoke, Powhatan, Pamlico, Shawano, Ojibwa, Ottawa, Menominee, Potawatami, Sack, Fox, Kickapoo, Blackfoot, Cheyenne, and Arapaho. See these titles; also INDIANS.

ALGON′QUIN. An important Indian tribe formerly centring about Nipissing Lake and the middle Ottawa River, Ontario. The name (more properly Algomekin) signifies people "on the other side" of the river. French missionaries began work among the Algonquins early in the seventeenth century, and soon discovered their language to be the key to all the numerous dialects now included by philologists under the Algonquian stock. In consequence of destructive wars waged against them by the Iroquois, the tribe rapidly declined, some fleeing to the Upper Lakes, where, with other refugees, they became known later as Ottawas (q.v.); while others, retaining the old name, were gathered into mission villages under French protection. There are now about 960 Algonquins settled in several villages in Quebec and Ontario, exclusive of those confederated with Iroquois at the Lake of Two Mountains, in Quebec, and at Gibson, Ontario, to the number of perhaps 250 more.

AL′GORISM. A word variously used in arithmetic. Primarily it referred to the system of Hindu numerals, concerning which European scholars received much of their early information through the work of Al-Khuwarizmi (q.v.), or Algoritmi, as the name appeared in the mediæval Latin. Those scholars who adopted the Hindu numerals were called, from his name, Algorists, as distinct from the Abacists, who used the abacus in their computations. The word appears in various forms, as algorithmus, algrim, augrim (Chaucer). At present the word is generally used to designate any particular arrangement of numerical work, as the algorism for square root or the algorism for division. See ARITHMETIC.

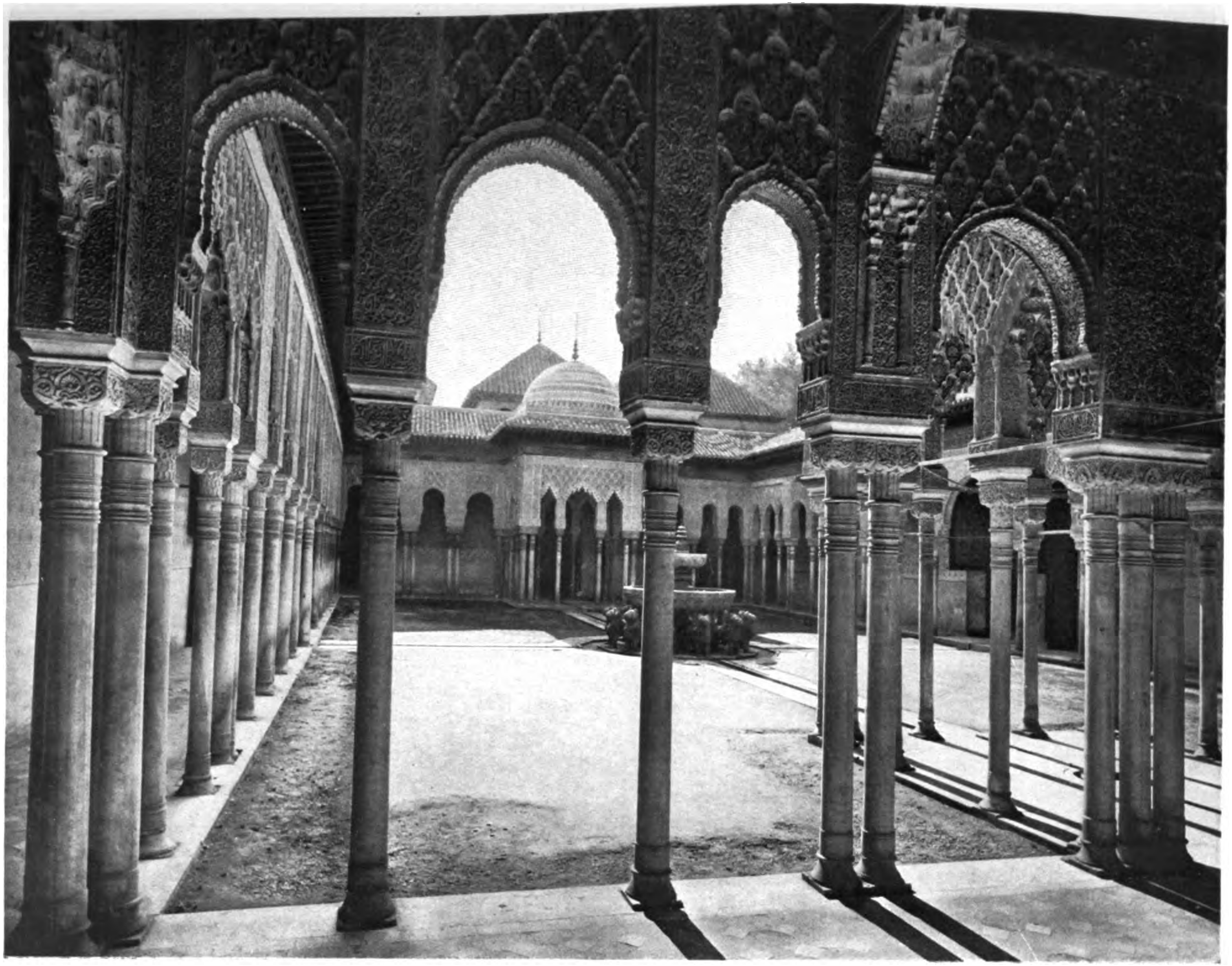
ALGUACIL, ăl′gwȧ-thēl′, or **ALGUAZIL** (Sp. *alguacil*, for Ar. *al-wazîr*, the vizier). The general name in Spain of the officers intrusted with the execution of justice. There are *alguaciles mayores*, who either inherit the office of executing justice in a town as a hereditary right belonging to their families, or are chosen to the office by the municipality; formerly the name was also given to the officers that executed the sentences or orders of tribunals, such as the tribunal of the Inquisition, and of the various orders of knights. But usually, under the name of Alguacil, is understood the *alguaciles menores*, or "ordinarios," that is to say, the attendants or officers of the courts of justice, gens-d'armes, bailiffs—in short, all the inferior officers of justice and police who are appointed to their office by the judges, *alguaciles mayores*, or town council.

ALHAGI, ăl-hăj′ĭ. See MANNA.

ALHAMA, ȧl-ä′mȧ (Ar., the bath; the Roman Astigia Juliensis). A town of Andalusia, Spain, in the province of Granada, 25 miles southwest of Granada (Map: Spain, C 4). Its situation is wild and romantic in the extreme. The town is built, terrace above terrace, upon a hill on either side of which rise naked limestone crags, while the Sierra Alhama towers to the height of 8000 feet in the background. Alhama is notable for its baths, which are much frequented in the spring and fall. They are situated in the valley of the Marchan, and are of a sulphurous character, and reach a temperature of from 107° to 113° F. The Baña de la Reina is a Roman building of great antiquity; the Baño Fuerte is a Moorish structure. An earthquake in 1884 wrought much destruction to the upper town. Alhama was a watering-place and fortress in the time of the Romans. Its name in Arabic means "The Bath," and the Moors valued highly its medicinal springs. It was, however, chiefly as a fortress and outpost to Granada that it was important to them, and when it was captured by the Christians, February 28, 1482, it caused the widespread mourning expressed in the famous ballad, "*Ay de mi Alhama!*" well known in the English translation. Pop., 1900, 7683.

ALHAMA. A town of Murcia, Spain, situated at the foot of the Sierra de España, on the southern slope, 13 miles southwest of Murcia (Map: Spain, E 4.). It is celebrated for its sulphur springs and warm mineral waters, 102° to 108° F., and is a favorite résort of invalids and holiday-seekers in spring and early summer. It has a ruined castle. Alhama figured in the Moorish wars. Pop., 1900, 8410.

ALHAM′BRA (Ar. *al*, the + *ḥamrâ*, red). The fortified palace citadel of the Moorish kings of Granada. As early as the Ninth Century a citadel was located here with the name al-Hamra, which was rebuilt when Granada became the capital of what was left of the Moorish dominions in Spain, by King Mohammed Ibn-el-Ahmar and his successors (1248, 1279, 1306, 1354). The citadel stands on a hill north of Granada, on a terrace about 2500 by 675 feet, and is surrounded by a wall with 13 square towers, over a mile in circuit, built of the red brick which gave it the name of *Kal'at el-Ḥamrâ*, "The Red Castle." Inside the citadel were beautiful gardens, a donjon citadel, a gate of justice, a watch tower, and, finally, the palace itself, as sombre and plain on the outside as it was smiling and decorative within. Charles V. destroyed a large part of it (especially the Winter Palace) to make room for a tasteless Renaissance building, and Philip V. still further mutilated it. Mutilated as it is, it remains the best proof of the artistic character of the Moorish dominion in Spain, even though in details the work may not be so exquisite as earlier work in Egypt and the East. What re-



ALHAMBRA
THE COURT OF LIONS

mains is grouped around two principal oblong courts, the Court of the Blessing (140x74 feet), and the Court of the Lions (116x66 feet). There are porticoes, pillared halls, small gardens, and a mosque. The Court of the Lions is surrounded by arcades supported by 124 white marble columns, while similar arcades frame the ends of the other court. The main reception-hall, called the Hall of the Ambassadors, is a square (37 feet), surmounted by a beautiful dome 75 feet high, with stalactite pendentives. Connected with the Court of the Lions are two smaller, but equally exquisite, halls, the Hall of the Abencerrages, with a dome and exquisite columns, used as a banquet-hall, and the Hall of the Two Sisters, a pleasure-room communicating with the baths. There is a network of smaller apartments. All the surfaces are decorated with a bewildering mass of color and design in tiles, stucco, and painting. Red, blue, black, and gold are the principal colors; the ornamentation comprises not only the plain geometrical patterns, but also a profusion of Cufic mottoes and of heraldic floral designs and arabesques. The most characteristic parts were reproduced in the Alhambra Court of the Crystal Palace, at Sydenham, and the palace has served as a model for innumerable modern imitations of Moorish art. The Alhambra was partly restored by Queen Isabella II., but was damaged by fire in 1890. See MOHAMMEDAN ART.

Consult: Washington Irving, *The Alhambra* (New York, 1832); Goury and Jones, *Plans, Elevations, Sections and Details of The Alhambra* (London, 1842); M. Junghändel, *Die Baukunst Spaniens* (Dresden, 1889); Girault de Prangey, *Monuments arabes et moresques d'Espagne* (Paris, 1839); Bisson, *Choix d'ornements moresques de l'Alhambra* (Paris, 1855).

ALHAMBRA, THE. A famous collection of tales and legends of the Alhambra, by Washington Irving (1812).

ALHAZEN, ȧl-hä'*zen*, EL-HASAN IBN EL-HASAN IBN EL-HAITAM, ABU 'ALI (c.965-c.1039). An Arabian mathematician and physicist. From his native city, Basra, he went to Egypt, and died in Cairo. A man of remarkable intelligence and productiveness, he wrote commentaries on Aristotle, Galen, Ptolemy, Euclid, and Archimedes, and also made numerous original contributions to science. His *Optics*, the most important Arabic work on the subject, was translated into Latin, probably by Gerard of Cremona, and not by Vitellius, who wrote an original work on optics, and was published at Basel in 1572 under the title, *Opticæ Thesaurus Alhazeni Arabis Libri Septem, nunc primum editi, eiusdem Liber de Erepusculis et Nubium Ascensionibus, etc., a Fed. Risnero.* Various other of his works have been translated in whole or in part by Woepcke, Sédillot, Suter, and Baarmann. He is now known chiefly from the problem bearing his name: From two given points within a circle to draw to a point on the circumference two lines which shall make equal angles with the tangent at that point. For bibliography of this problem, consult the *American Journal of Mathematics*, Volume IV., 327.

AL-HEN'NA. See HENNA.

ALHÓNDIGA DE GRANADITAS, ȧl-ōn'-dē-gȧ dȧ grä'nȧ-ᵺē'tȧs. A fortified public storehouse near Guanajuato, Mexico, where, in 1810, in the beginning of the revolution against Spain, the local government officials took refuge and defended themselves vigorously, being captured only after severe fighting by the insurgents under Hidalgo. Local tradition of the fight declares that when the Spaniards in the granary had exhausted their stock of cannon balls, they used bags of silver coins, fresh from the mint, and also quicksilver flasks, which were stored there for use in connection with the great silver mines of the place. Hidalgo was subsequently defeated and executed at Chihuahua, and his head was suspended from a spike on the wall of the Alhondiga, now the local prison.

ALI, IBN ABU TALIB, ä'lē ĭb-nä'bōō tȧ'lēb (c. 600-661). Fourth caliph, cousin of Mohammed, and one of his first converts. Ali became a staunch adherent of Mohammed, and fought bravely and vigorously for him. On the death of Mohammed it was expected that Ali, who had married Fatima, the daughter of the Prophet, would succeed to the caliphate, but he only reached that office on the murder of Othman, the third caliph, in 656. His caliphate was very stormy and full of wars, due to the opposition of Aisha, the young widow of Mohammed, and her party, chief among whom stood Muawiyah, the commander of Syria. At the battle of the Camel, fought at Basra in 656, Aisha was captured, and later Muawiyah was met at the battle at Siffin. On the 22d of January, 661, Ali was attacked by three members of the Kharijite sect, and murdered at Kufa. Near this city he was buried, and when later a monument was raised to his memory, so many pilgrims came that it became the centre of a city, Masjid Ali. After his death his followers formed themselves into a sect called the Shiite, which numbers about fifteen millions, scattered in Irak, Syria, Afghanistan, India, and in the neighborhood of Medina. Persia is a decidedly Shiite country, while Turkey is Sunnite. The Fatimides, who reigned in Egypt, were believed to be the descendants of Ali and Fatima. Ali was noted for his great knowledge and wisdom. Fleischer published Ali's *Hundert Sprüche* ("Hundred Maxims") in the Arabic and Persian texts, with a translation (Leipzig, 1837). The *Diwan* was published by Kuypers (Leyden, 1745), and later at Bulak in 1840. Some of the maxims and poems attributed to Ali, of course, may be genuine, but the majority of them bear traces of later composition. Consult Brockelmann, *Geschichte der arabischen Litteratur*, Vol. I., pp. 43-44 (Weimar, 1898).

A'LIAS. A name other than his true and proper name by which a person passes or is known. The phrase (Lat. *alias dictus*, otherwise called) from which the term is derived was formerly employed in indictments and pleadings to render absolutely certain the description of the individual intended by adding his fictitious or assumed name. In order to constitute an alias, the name so described need not be assumed for purposes of deception or from any improper motive. Stage names, pseudonyms, and even nicknames. are properly comprehended under the term. But a name which has, by legal process, been assumed in lieu of one's original name, is not an alias. See NAME.

ALI BABA, ä'lē bä'bȧ. The hero of the story of *Ali Baba and the Forty Thieves*, in the *Arabian Nights' Entertainments*. He is a poor forester, who accidentally learns the magic formula which opens the door to a robbers' cave. In their absence he repeats the "open sesame" (which has thus become proverbial), enters the cavern, and loads his ass with their treasures. His brother, Kasim, tries to imitate his success in carrying off their wealth, but after entering the cave, forgets the word "sesame," and so is entrapped and slain by the robbers. These then come to Ali Baba's house concealed in oil jars. They are discovered, however, by the ingenious slave girl, Morgiana, who kills them with boiling oil.

ALIBAUD, ȧ'lē'bō', Louis (1810-36). A French soldier and radical Republican, who attempted to kill King Louis Philippe at the gate of the Tuileries, June 25, 1836. He was guillotined July 11 of the same year.

ALIBERT, ȧ'lē'bâr', Jean Louis (1766-1837). Physician to Louis XVIII., of France. As chief physician of the hospital of St. Louis he devoted himself especially to a study of diseases of the skin. His chief work was *Traité complet des maladies de la peau* (1806-27).

ALI-BEY, ä'lē-bā' (1728-73). Mameluke ruler of Egypt. He was born in Abkhasia in the Caucasus, and when a boy was sold as a slave into Egypt. He gained the favor of his master, and rose to be one of the Mameluke beys. In 1766 he seized the Government, freed himself from the power of the Sultan, coined money, and assumed the rank of Sultan of Egypt. Soon afterward he captured and plundered Mecca, and undertook to conquer all Syria, in alliance with Daher, Pasha of Acre. At Damascus, June 6, 1771, he routed the Turks with great slaughter and took possession of the city through his general, Mohammed; but the latter turned against him and, proceeding to Egypt, put an end to Ali-Bey's power at Cairo. Returning with an army from Syria, Ali-Bey was defeated at the battle of Salahieh, and perished a few days later.

AL'IBI (Lat. elsewhere). A defense resorted to in criminal prosecutions, when the party accused, in order to prove that he could not have committed the crime with which he is charged, tenders evidence to the effect that he was in a different place at the time the offense was committed. When true, there can be no better proof of innocence; but, as offering the readiest and most obvious opportunity for false evidence, it is always regarded with suspicion. Consult Wharton, *Criminal Law* (Philadelphia, 1896).

ALICANTE, ä'lē-kän'tȧ. The chief town of a province of the same name in Spain (Map: Spain, E 3). It is picturesquely situated on a steep hill, at the bottom of which it extends along a level strip of land. This latter portion of the city is comparatively modern, well built, and convenient, with fine squares and promenades. The upper city is a jumble of narrow crowded streets. It possesses a collegiate church, two parish churches, two nunneries, a library, a bishop's palace, and a picture gallery. The town is overlooked by the castle of Santa Barbara from an eminence 850 feet above the sea. The town, which is, with the exception of Cadiz and Barcelona, the most important seaport of Spain, is strongly fortified. Alicante derives considerable revenue as a seaside resort; but its main source of wealth is the export trade, for it is the port of Valencia, and the oil and wine, silk and grain of that fertile province pass through this seaport to foreign countries. It has also a large tobacco factory, in which 6000 girls are employed. It is the seat of a United States consulate. Population, 1900, 50,142. Alicante (Lucentum) was an important town under the Romans, and its citizens had the Latin franchise. It was captured by the Moors in 713, and recaptured by Ferdinand III.

ALICATA, ä'lē-kä'tȧ. See Licata.

AL'ICE. (1) The name of the Wife of Bath, in Chaucer's *Canterbury Tales*.

(2) In Shakespeare's *Henry V.*, one of the Princess Katherine's ladies in waiting.

(3) The heroine of an Elizabethan tragedy, *Arden of Feversham* (q.v.).

(4) In Meyerbeer's opera *Robert le Diable*, the foster sister of Robert, who saves his soul from ruin.

ALICE MAUD MA'RY, Princess, Grand Duchess of Hesse-Darmstadt (1843-78). The second daughter of Queen Victoria, born April 25, 1843. She was much beloved by the English people for her amiability, gracious disposition, and domestic virtues. On July 1, 1862, she married Prince Ludwig of Hesse-Darmstadt. She died at Darmstadt, December 14, 1878, of diphtheria, a few days after the death of her youngest daughter from the same disease. Consult: Sell, *Letters with Memoirs of Alice, Grand Duchess of Hesse* (London, 1884); Helena (Princess Christian), *Letters with Memoirs of Alice, Grand Duchess of Hesse* (London, 1897).

ALICE, OR THE MYS'TERIES. A novel by Bulwer, published in 1838.

ALICE'S ADVEN'TURES IN WON'DERLAND. A story for children, by Lewis Carroll (C. L. Dodgson), published in 1869. It is the narrative of a little girl's dream. A sequel to it is *Through the Looking-Glass* (1871).

ALICIA, ȧ-lĭsh'ĭ-ȧ. (1) In Rowe's tragedy *Jane Shore* (q.v.), a mischief-making lady who ruins the heroine, through jealousy, and goes mad herself.

(2) In Lillo's *Arden of Feversham*, the same character as Alice Arden, in the original Elizabethan tragedy of the same name.

ALICULUF, ä'lē-kōō-lōōf'. A tribe occupying the central region of Tierra del Fuego, South America, and perhaps representing a distinct linguistic stock, although future investigation may establish a connection with the Yahgan or the Tehuelche (q.v.). Although they go almost naked in the coldest weather, and huddle in shelters hardly deserving the name, they show great skill in the making of weapons, fishing utensils, and canoes, while the women weave water-tight baskets of reeds. They have also trained a native dog to hunting.

AL'IDADE (Ar. *al-'iḍādah*, the revolving arm). A radius bearing a vernier (q.v.), which travels around a graduated circumference. When an angle is to be measured, the alidade takes first the position of one arm of the angle and then of the other, and the arcs are "read" by the vernier; the difference of the two readings is the measure of the angle. See Compass.

AL'IEN (Lat. *alienus*, strange, foreign). One recognized by the State in which he sojourns as owing primary allegiance to a foreign sovereign. It is used ordinarily in contradistinction to citizen (q.v.). An alien may become a citizen by *naturalization* (q.v.). Alien friend and alien enemy denote, respectively, an alien whose country is at peace, or is at war, with the country where he is sojourning. In Great Britain the status of aliens is regulated by the Naturalization Act of 1870 (33 and 34 Vict. c. 14). In this country their status is determined generally by State laws, although these are subject to some modification by treaties between the Federal Government and that of a foreign country. An alien does not possess political rights, nor is he subject to the political duties of a citizen, and yet he may be required to serve in the militia or police of the country where he is residing, and to contribute to the support of such establishments. At common law an alien could not become an owner of real property, although a distinction was made between a case of title by *purchase* (q.v.) and by *descent* (q.v.). If an alien acquired title by purchase, as by a grant (q.v.), or devise (q.v.), he was allowed to hold it until office found (q.v.), that is, until his alienage was duly established, upon inquiry instituted by the proper official, while apparent title by descent was absolutely invalid. This common law disability has been removed in England, as well as in many of our States; and aliens may now acquire, convey, and transmit title to real and personal property in the same manner as citizens. An alien friend may contract, sue, and be sued as though he were a citizen while he is allowed to remain in the country; but he may be expelled or deported at any time, subject to treaty stipulations; his immigration may be prevented, or may be permitted, subject to imposed conditions. An alien enemy is not allowed to maintain an action in the courts of this country, unless he can show some special authority or license therefor; but he may be sued here. Nor can he enter into valid contracts with citizens which are inconsistent with a state of war. The tendency of modern law is to accord to alien enemies, who are permitted to remain in a country, all the rights and privileges of alien friends. Consult: Nelson, *Select Cases, Statutes, and Orders Illustrative of the Principles of Private International Law* (London, 1889); Cockburn, *Nationality* (London, 1869).

ALIEN AND SEDI'TION ACTS. A series of statutes enacted during the administration of John Adams (q.v.), occasioned largely by the desire of the party in power to stifle the more virulent forms of political opposition then prevalent, and to check the activities of those who sympathized with France. There were four statutes passed in execution of the policy of the Federalists (q.v.), of which two became especially notorious. The Alien Act, passed June 25, 1798, to remain in force two years, gave the President power to order the removal from the country of aliens judged to be dangerous, and provided that if those so notified did not leave the country or secure from the President a license to remain, they would be subject to imprisonment for not over three years, and be disqualified from ever becoming citizens of the United States. The President also might order the removal from the country of any alien thus imprisoned, and if such alien should thereafter be found in the country he might be imprisoned for as long a period as the President should deem the public safety required. The Sedition Act, passed July 14, 1798, to be in force until March 3, 1801, imposed penalties not exceeding a fine of $5000 and five years' imprisonment for conspiring against the government and its measures, and for interfering with the operations of the government. It imposed a penalty of imprisonment for not over two years and a fine of not over $2000 for printing scandalous material concerning the Federal Government, the President or Congress. There were also passed the Alien Enemies Act, July 6, 1798, providing for the treatment of aliens with whose government the United States might be at war, and the Naturalization Act, June 18, 1798, fixing fourteen years' residence as a qualification for the acquisition by foreigners of citizenship. The extreme character of these statutes and the partisan spirit which produced them caused an immediate and violent reaction, which was expressed in such forms as in the Virginia and Kentucky Resolutions (q.v.), and which hastened the overthrow of the Federalist party. See historical section under UNITED STATES.

AL'IENA'TION (Lat. *alienatio*, the transferring of the possession of a thing to another, from *alienus*, another's, foreign). A legal term to describe the transfer of title to land, or of any interest therein. The modes in which alienation is effected are numerous, ranging in our legal system from the feoffment (q.v.), or livery of seisin (q.v.), of old English law, to the modern transfer by deed (q.v.) or will (q.v.). (See CONVEYANCE.) The right of alienation is one of the two great incidents of the ownership of property, as now understood (the other being the right of inheritance); but this is a distinctly modern notion, and ownership may well exist, and has often existed, without the right to alienate the property owned. In English law the right of a freehold tenant to alienate his lands was long restricted by rules derived from the feudal system. Most of these restrictions were swept away by the third statute of Westminster (18 Edw. I., 1290), known as the Statute Quia Emptores (q.v.), which declared that from thenceforth "it should be lawful to every freeman to sell at his own pleasure his lands and tenements, or part of them," and the few that remained, by the statute of Military Tenures, passed in 1660 (12 Car. II., c. 24), which deprived the crown of the right to exact of its tenants *in capite* the obnoxious fines on alienation. But it was not until the thirty-second year of Henry VIII. (1527), that the right to alienate lands by will was finally conceded by Parliament. Now, however, the principle of the alienability of real property has become so firmly established, that we cannot conceive of absolute ownership without that quality, and it has long been a rule of our law, that a condition attached to the grant of a fee, forbidding or restraining its alienation, is void, as being repugnant to the estate granted. It should be said, however, that such conditions annexed to life estates and leaseholds are perfectly good and of frequent occurrence.

Alienation may be either voluntary or involuntary. The former comprehends the usual modes of conveyance, including transfers by will. The latter refers to the acquisition of title by judgment, execution, bankruptcy, and the other modes in which creditors have at different times and in different jurisdictions been permitted to satisfy their claims by legal process out of the real property of the debtor. See the authorities referred to under the title REAL PROPERTY.

AL'IENIST. See PSYCHIATRY.

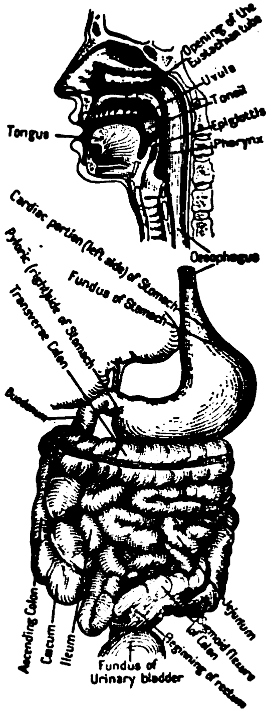
ALI FERROUGH BEY, ä′lē fĕr′rō bā (1865—). Minister Plenipotentiary and Envoy Extraordinary of Turkey to the United States. He was born at Constantinople, and has been successively secretary of embassy at Paris, London, and Bucharest, and councilor of embassy at St. Petersburg. He has published *Public and Private International Law*, and histories of Arabia and Turkey. He was recalled from his post at Washington in 1901.

ALIGARH, ä′lē-gär′. The capital of the district of the same name, in the North-West Provinces of India, the native name of which, Koil, has been replaced by that of the adjoining fort famous for its commanding situation and historic associations. The fort, at an altitude of 740 feet, stands in lat. 27° 56′ N., long. 78° 8′ E., 47 miles north of Agra and 74 miles south of Delhi (Map: India, C 3). Its capture from the Mahrattas in 1803 by General Lake assured British supremacy in the Upper Doab, and it was the scene of exciting incidents during the mutiny of 1857. The town on the railway route from Calcutta to Peshawar is a thriving municipality, with a population in 1891 of 61,485; 1901, 70,434. Aligarh is the seat of the Mohammedan Anglo-Oriental College, which is connected with the University of Allahabad.

ALIGN′MENT. A term used in military tactics, equivalent to "in line." Thus, the alignment of a battalion is effected when the men are drawn up in line; the alignment of a camp is a rectilinear arrangement of the tents, according to some prearranged plan.

ALIMA, ȧ-lē′mȧ. A tributary of the lower Congo, rising in French Congo, and after a short course westward emptying at Ibaka (Map: Congo Free State, C 3). In its lower course it is navigable for light vessels. It was discovered by Brazza in 1878, and thoroughly explored by Balley in 1883.

AL′IMEN′TARY SYS′TEM (from Lat. *alimentum*, food). In mammalia, that portion of the digestive apparatus through which the food passes from the time of its entrance until its exit from the body. It is lined by a mucous membrane, which extends from the lips to the anus, being modified in each region. (See MUCOUS MEMBRANE.) The alimentary canal begins at the mouth, and is continued into the space called the pharynx, which communicates with the nostrils above, and the gullet or œsophagus below, and with the mouth in front. The pharynx is surrounded by three muscles, the constrictors, which grasp the food, and force it into the next portion of the alimentary canal, the œsophagus. This is a tube composed of an outer layer of longitudinal muscular fibres, and an inner of circular, which extend down to and spread out upon the stomach. These fibres, by a series of peristaltic contractions, carry the morsel of food along into the stomach. In vomiting, there is a reversal of these actions, which ruminating animals can accomplish at will. The œsophagus passes through an opening in the diaphragm, and joins the stomach, which is a pouch curved with the concavity upward, expanded into a *cul de sac* on the left side (the cardiac extremity), and gradually narrowed to the right or pyloric end. It consists of muscular fibres continuous with those of the œsophagus, which become thicker toward the pylorus. Its external surfaces are covered by peritoneum, and its thick, soft mucous lining, when the stomach is empty, lies in folds. Between the muscular and mucous layers is a fibrous layer, in which the blood-vessels lie before they pass into the mucous layer. (See STOMACH.) At its pyloric or right extremity the stomach communicates with the small intestine, which is about 22 feet in length, becoming gradually narrower toward its lower end, and arranged in convolutions, which occupy the middle portion of the abdominal cavity, and are kept in position by the mesentery, which attaches them to the posterior wall of the abdomen.



ALIMENTARY TRACT IN MAN.

The small intestine is subdivided into three parts. The first ten inches from the stomach constitute the *duodenum*. Into it open the duct of the pancreas and the common bile duct. Of the remaining portion, the *jejunum* includes about two-fifths and *ileum* three-fifths. The differences between these last two consist in modifications of their internal structure. The tube consists of three layers and the whole is surrounded by peritoneum. See INTESTINE.

The ileum ends at the right iliac region in the large intestine, which is from five to six feet in length. It begins at the pouch called the blind gut or *cul de sac* (see CÆCUM), which has a small, worm-like appendage (*appendix vermiformis*); a double valve guards the opening of the small into the large intestine. The colon passes upward on the right side to below the liver (ascending colon), then crosses from the right hypochondrium across the upper umbilical to the left hypochondrium (transverse colon), then descends to the left iliac fossa (descending colon), when it bends like an S (sigmoid flexure), and then joins the rectum at the left margin of the true pelvis. The colon is distinguished by its pouched or sacculated appearance and the presence of an exterior of three flat bands of longitudinal muscular fibres. The peritoneum covers it only in parts. (See COLON.) The rectum is not sacculated, but its muscular coat becomes much thicker; at its lower end the longitudinal muscular fibres stop, but the circular fibres become greatly increased, forming the internal sphincter muscle. (See ANUS.) The rectum is not straight, but takes a curved course.

The alimentary canal thus consists of a continuous passage lined by mucous membrane, which rests on a fibrous and muscular basement. Its length is generally about five or six times the length of the body, or, in other words, about

30 feet. It begins below the base of the skull, and passes through the thorax, abdomen, and pelvis, and consists, in brief, of the mouth, pharynx, œsophagus, stomach, small intestine and large intestine. The above description refers to the alimentary canal in human anatomy; its parts are variously modified in different animals, as will be found in the articles on its several subdivisions. The process of carrying the digested food to the tissues of the body is discussed under CIRCULATION.

ALIMENTARY SYSTEM, EVOLUTION OF THE. An alimentary system as defined above is almost wanting among plants, which, practically without exception, use only fluid or gaseous food, or else render solid substances fluid before ingestion. This difference between animals and plants is one of the best distinguishing characters.

TYPES OF ALIMENTARY TRACTS. The simplest may be designated the temporary type—that exhibited by Amœba. This jelly-like, amorphous organism, when it comes upon a solid particle in the water, simply engulfs it at any point by flowing around it. The engulfed particle is surrounded by a sphere of water. From the plasma of the Amœba an acid is secreted into the sphere of water, and this dilute acid gradually dissolves the solid particle; the solution is then absorbed by the protoplasm. In the case of the Amœba there is no definite, permanent alimentary tract. The same is true of all the rhizopodous Protozoa, and of the parasitic ones, which do not feed on solids. Many of the ciliate and flagellate Infusoria, on the other hand, ingest solid particles through a permanent mouth and gullet into the general protoplasmic spaces. The surface around the mouth opening may be provided with cilia to carry food into the mouth.

The second type of alimentary tract is permanent but diffuse. This is the type exhibited by sponges. There is not one digestive region, but hundreds of them, as many, indeed, as there are pores and canals passing through the body wall. The solid food passes into these canals; the canals are lined by curiously modified "collared" cells. These pick up the particles and engulf them, as a flagellate infusorian does. The whole sponge, indeed, behaves like a colony of Protozoa, specialized in different directions in different regions of the sponge body.

The third type of alimentary tract is permanent, and concentrated in one cavity, and that cavity is a sac, having only one external opening. This type is characteristic of all the Cnidaria, and is found in certain flatworms. It is typically illustrated by Hydra. Hydra consists of a body wall surrounding a central cavity that has one opening at the upper pole, surrounded by a circlet of tentacles. The opening serves both as mouth and anus. The body wall is two-layered; the outer layer is the sensory one; the inner layer is digestive. The origin of this type is uncertain; it seems quite likely that it has not developed from the sponge type, but that it represents an altogether new line of evolution, in which the body is not to be considered as a colony of infusoria-like cells, but as a greatly enlarged protozoan, with many nuclei and hence with many cells. On this last hypothesis the digestion cavity of Hydra would be homologous with that of an infusorian. In the sea anemones the digestive sac is more complicated than in Hydrozoa, in that it is divided into a number of alcoves opening into one central chamber. The alcoves arise in consequence of a series of radial partitions (called mesenteries) arranged in a plan of four and its multiples or six and its multiples, that pass from the outer body wall toward the centre. In the sea anemones the entrance to the digestive sac is an elongated slit that serves both as mouth and anus. According to one theory, the separate mouth and anus of higher forms arise from opposite extremities of this slit, while in the middle part of the slit the lips are fused together. In the lower flatworms, the planarians and trematodes, the body is elongated, and the digestive sac is elongated likewise; but it is still a sac with a single opening. The cestodes, being abject parasites living in the digestive juices of the host, need no digestive tract and have none. In the higher flatworms, nemathelminths, Nemertinea, Bryozoa, and Brachiopoda, as well as in mollusks, mouth and anus have become distinct, and the digestive sac has become a digestive tube or canal, as in higher groups. With the formation of a digestive tube three portions may be distinguished, namely: fore gut, mid gut, and hind gut. The first and last are usually of ectodermal origin. The mid gut is usually lined by entoderm. These three parts of the alimentary tract undergo special modifications. The beginning of the fore gut, or mouth, becomes fitted with grasping and sensory organs; and lower down in the œsophagus there is frequently found a crushing organ, the gizzard. The mid gut is very glandular. In many species the glands have enlarged to perform their work better, and appear as appendages of the mid gut; e.g., the pancreas or hepatopancreas. The hind gut is the rectum. These conditions are shown in their simplest form in the annelids. The sandworm of the sea coast has great jaws in the œsophagus, which is protrusible. Behind, a pair of digestive glands open into the food canal. In the earthworm, the œsophagus leads into a crop, and this in turn into a muscular gizzard. In the intestine two dorsal grooves add to the glandular surface. Passing to arthropods, we find the mid gut occasionally coiled, and frequently bearing digestive glands, that gain a great size in the Decapoda. A gastric mill is present in the Malacostraca. In both annelids and arthropods the mouth is on the same side of the body as the great nerve cord, and the anus is placed in the last metamere of the body.

In the Chordata the alimentary tract has very different relations from those found in the Annelida and Arthropoda. In the latter groups the alimentary tract lies dorsal to the main nerve and ventral to the heart; in the chordates the tract is dorsal to the heart and ventral to the spinal cord. The question how the vertebrate condition is derived from the invertebrate condition is a difficult one to answer. It has even led some to deny that vertebrates are related to Annelida or Arthropoda, as it is impossible to think of an animal adapted to traveling on one surface turning over and traveling on its back and transmitting this tendency to its descendants. It is more likely that the intermediate form was one that, like many of the lowest Chordata—the tunicates—was sessile in a ventral position at some time of life, and consequently had neither dorsal nor ventral surface.

EMBRYOLOGICAL HISTORY. The history of the alimentary tract in vertebrates is as follows: Part of the outer layer of the germ becomes infolded as a pocket to form the lining of the archenteron or primitive gut. (See EMBRYOLOGY.) By the continued growth of the mesoderm and body cavity the archenteron comes to lie as a canal, closed at the anterior end and communicating posteriorly through the "neurenteric canal" with the neural tube. Later, an infolding of ectoderm occurs on the ventral surface of the embryo to form the proctodeum and anus. The neurenteric canal closes and the post-anal gut degenerates. Finally the ectoderm is inpocketed at the anterior end of the archenteron, forming the stomodeum, and the two cavities become confluent by the breaking away of the opposed walls. Thus, the completed alimentary tract is composed of an ectodermal anterior and posterior end and of an entodermal middle portion. It is enveloped by a mesodermal layer.

Phylogenetically, two quite distinct parts in the alimentary tract of vertebrates can be distinguished, and these do not coincide with the embryological divisions. In Amphioxus more than the first half of the length of the alimentary tract is devoted to the purpose of respiration, since its walls are provided with gill-slits. This may be called the respiratory part of the alimentary tract in contradistinction to the remaining hinder portion—the digestive part. The first is also known as the prosenteron. The hinder part is often divided into two—its entodermal part (mesenteron) and its proctodeal portion (metenteron). It will be convenient to treat of the alimentary tract under the three heads of prosenteron, mesenteron, and metenteron. Before going on to this analytical treatment of the tract and its appendages, a few words may be said concerning the general histology of the entire tract. As already stated, two germ-layers are involved: entoderm · (or ectoderm) and mesoderm, and to these must be added mesenchyme. The entoderm is always a single layer and forms the so-called *mucosa;* it gives rise to the digestive and glandular epithelium. Next outside lies the mesenchymatous mass, with its blood-vessels and nerves—the *submucosa.* Outside of this is the muscular layer derived from mesoderm and containing within circular muscle fibres and without longitudinal ones. Lastly, outside of all and continuous with the lining of the body cavity in all its parts, is the layer of flat epithelial cells, constituting part of the peritoneal membrane.

The Prosenteron.—This region is characterized, in the lower forms, by gills. In Balanoglossus and in Tunicata such a gill-bearing region is well developed, and in the Tunicata becomes extremely complex, in adaptation to their sessile habit, which requires large respiratory surface, since a change of water cannot be got by traveling. In Amphioxus the gill-slits are simple but very numerous—a hundred or more. The variability in number arises from the fact that the slits continue to increase in number as the animal grows older, new ones being formed at the posterior end of the series. Thus the prosenteron grows at the expense of the mesenteron. In embryologic history a single row of fourteen slits first arises as ventro-dextral organs; next, a second row of nine slits is formed at the right of the first, which, as it grows larger, pushes the first row to the left side, where it lies permanently. The cause of the development of the left series on the right side is that the large mouth at first occupies the left side, and its movement ventrally is accompanied by profound changes in the surrounding parts. It has been suggested that the mouth of the ancestors of vertebrates was placed in the mid-dorsal line in front of the notochord; but that, the support of the notochord being needed for the snout in the animal's journeys through the sand, it pushed forward and thrust the mouth to one side. The mouth is dorsal, or, better, *neural,* in young tunicates and in adult annelids; and the embryonic changes in the position of the mouth in Amphioxus apparently recapitulate the phylogenetic changes. The gill-slits of the young Amphioxus open from the gut cavity directly to the exterior, but later they open into a common atrium on the ventral side, which functions somewhat as an operculum. The details of the gill system of higher vertebrates will be discussed under RESPIRATORY SYSTEM. It is here merely necessary to say that the number of gill-slits becomes much reduced, usually to five or six pairs of slits.

The Mouth.—The beginning of the alimentary tract is enlarged to form an oral or buccal cavity, provided with teeth and glands. The glands are modified skin glands, as would be expected from their ectodermal origin. The glands develop by a depression of the epidermis, and come to lie imbedded deeply in the cutis of mesenchymatous origin. The function of the glands is to keep the mouth moist, consequently they are found only in land vertebrates. The poison glands of serpents are modified oral glands. Salivary glands find their highest development in mammals. They are probably immensely developed skin glands or groups of such. They secrete a thick, glairy fluid, whose chief function is to moisten the food and thus to assist in its mastication and deglutition. On this account these glands are most highly developed in the Herbivora and are absent in Cetacea. Saliva also acts upon starchy food, converting it into sugar.

The tongue is a mass of intertwined muscles, having various functions, as of tasting, grasping, touching, and speaking. In fishes it is little developed, being represented by a thickening of the mucosa covering the ventral part of the hyoid bone. In Amphibia and reptiles it shows a great advance in size and complexity, being capable of extrusion to a great extent (especially in lizards), both through the elongating action of its intrinsic muscles and the forward movement of the base of the hyoid bone.

The thymus gland arises in fishes by the budding off of epithelial masses from the anterior four or five gill pockets; it is thus of multiplex origin. Usually these independently arising masses fuse into a pair of spindle-shaped bodies, but in the Gymnophiona the components persist as distinct bodies. In the land vertebrates, with fewer gill-slits, the points of origin are reduced in number. Into the paired masses connective tissue and blood vessels grow, eventually constituting the greater part of the organs. The function of the thymus is still unknown. It attains its largest size in reptiles and birds. In man it reaches its maximum development in the second year and then gradually degenerates.

The thyroid gland arises directly from the alimentary tract. It has a double origin. First, it arises as an unpaired pocket of the ventral wall of the pharynx behind the last gill-slit: the paired masses are called "accessory thyroid glands." The median part is morphologically the most important. It is the only part found in Amphioxus and Cyclostomi. In these groups it exists as a groove in the ventral wall of the pharynx, called the "hypobranchial groove." A similar groove is found in all tunicates (the "endostyle"), and is glandular in function. In the lower true vertebrates, where the paired components first arise, they remain distinct; in mammals all components fuse.

Œsophagus and Stomach. These parts of the alimentary tract constitute the fore gut in the more restricted sense. They are limited anteriorly by the oral cavity; the limitation is a sharp one, however, only in mammals, which possess a soft palate that curtains off the mouth from the respiratory passage. This soft palate makes its first appearance in the crocodiles, but without the uvula. The posterior limit of the fore gut is not always easy to fix, since not all vertebrates have a specialized stomach with a pyloric valve. The opening of the bile duct may be taken as the lower limit. The post-pharyngeal prosenteron is extremely short in Amphioxus and the lowest vertebrates, and is of relatively slight importance; it gains size and importance as we ascend the vertebrate series. The digestive function is, in the higher groups, transferred to a more anterior region of the enteron, and, coincidently, the entire alimentary tract, which is primitively straight, undergoes a great increase in length and becomes strongly folded. A differentiation of the prosenteron into œsophagus and stomach is first indicated in selachians, and becomes pronounced in Amphibia. The two organs differ not only in their diameter, but also in the character of the mucous membrane, which is smooth and forms a ciliated epithelium on the œsophagus and folded and nonciliated in the stomach. In birds the œsophagus is specialized, in that it is greatly enlarged at one point, forming the crop. The crop is best developed in granivorous birds; in it grain is acted upon chemically. Certain fish-eating birds have a reservoir (false crop) for excess of food. Insectivorous and frugivorous birds have no sign of a crop. The stomach, likewise, is very complex in birds. There is first a highly glandular chemically active *proventriculus*, and, below, a mechanically acting muscular stomach or gizzard. In mammals the stomach is the most distended and one of the most functional parts of the alimentary system. An anterior or cardiac portion can be distinguished from a posterior pyloric part. The stomach is larger and more complex in herbivores than in carnivores. In the herbivores the cardiac and pyloric parts are each divided into two parts. The first is a large sac called the pouch or *rumen*. It communicates broadly with the second chamber, the *reticulum*, so called from its network of folds. Next comes the *psalterium*, whose walls are raised into high, thick-set folds, so that under most circumstances nothing but semi-fluid materials can pass between the folds. The last part is the *abomasum*, with highly vascular and glandular walls. This complex stomach seems to have arisen by natural selection as an adaptation to the peculiar habits possessed by the ruminants. They are all weak, defenseless mammals, and their herbivorous habits require that they shall feed in open fields where the danger of detection by the larger carnivores is very great. The shorter the time they are exposed in the open field the less will be the chance of their destruction. It has therefore been of advantage that they have become able to crop a large amount of grass rapidly without masticating it, the mastication being first done after the ruminant has retired from the field to the secluded forest. The food thus taken into the stomach fills the rumen and reticulum, and is mingled with and partly macerated by the saliva. By the action of the abdominal muscles and diaphragm, as in hiccoughing, the food is returned to the mouth and is there masticated. Finally, divided and mixed with saliva, it passes down the œsophagus and is led by means of a special fold directly to the psalterium, through the leaves of which the finely triturated mass can pass. In the fourth part, or abomasum, true gastric digestion now occurs.

Intestinal Region. The mesenteron is, in the higher vertebrates, separated from the prosenteron by a circular fold of the intestinal wall, the pyloric valve. The function of the tract is, on the one hand, to secure fluids that will finish the work of digesting the food which was begun in the stomach, and on the other to absorb the products of digestion. The variations in form of the mesenteron are all to enable it to perform the processes to better advantage. Some of the variations are readily visible to the naked eye, such as the foldings of the gut or out-pocketings from it; others are microscopic, and due to foldings in the lining of the alimentary tract.

Liver and Pancreas. The largest of these out-pocketings is the *liver*. It is phylogenetically an old organ, as it occurs in all the vertebrates, even in Amphioxus. The form of the liver is always closely adapted to that of the cavity in which it lies. In myxinoids it consists of two lobes, and this is probably the "groundform" of the organ in all vertebrates. In many cases it is further subdivided into (dog, weasel) six or seven lobes even. The right lobe is the larger, and in it the gall-bladder, when present, lies imbedded. The liver arises as an evagination of the epithelial lining of the ventral wall of the anterior portion of the intestine. In Amphioxus it is located just behind the gill region. The hepatic fundaments are soon transformed into glands made up of branching tubules. The network of tubules early differentiates into excretory and secretory parts. In amphibians and reptiles the tubular nature of the gland is easily recognizable, but in higher vertebrates (birds, mammals, man) the tubular structure is inconspicuous. Simultaneously with the development of the tubules a meshwork of blood vessels appears in the liver. In birds and mammals at the point at which the primary bile ducts open into the duodenum a small evagination is formed. This evagination elongates to form the bile duct. The gall-bladder is a reservoir for storing the gall. It develops as an evagination of the bile duct or from the hepatic ducts. The liver serves as a storehouse in which the sugar not needed by the system for immediate consumption is stored up in the form of glycogen; it destroys the old red blood corpuscles and oxidizes nitrogenous materials into urea. Its function in digestion is less clearly understood. Fats, however, more easily pass through a membrane moistened with bile, and a greater proportion of fat passes unabsorbed through the intestine of a dog when the bile duct is stopped; hence bile probably aids in some way in the absorption of fats. The alkalinity of the bile also aids the pancreatic juice in overcoming the acidity of the gastric juice. Bile also aids in stimulating the action of the muscles of the intestine. Its absence leads to biliousness and even jaundice, and finally the bile acts as a preservative when deficient putrefaction of the contents of the alimentary canal results. The pancreas also arises as an evagination of the alimentary tract, but from the dorsal side of the duodenum, and usually opposite the origin of the liver. Except in cyclostomes and some teleosts, the pancreas is always present in vertebrates. Its size and form varies, and it is not infrequently lobate. In structure it is a racemose gland. Its secretion is either poured directly into the intestine (as in birds, crocodiles, Emydidæ, and some mammals), or as development proceeds its outlets move nearer and nearer the bile duct, and finally the secretions of the liver and pancreas are poured into the intestine through a common duct. The pancreatic secretion is alkaline. Its rôle in digestion is very great. Its action on starch is like that of the saliva, only much more energetic. Through the agency of the ferment trypsin it affects proteids, and by another ferment, steapsin, fats are split up into fatty acids and glycerine. The soap and glycerine are both soluble in water and hence are easily absorbed. Much of the fat, however, is emulsified by the albumen, that is to say, it is broken up into fine drops, which are prevented from fusing by the presence of a coating of albumen. The fat in the emulsion is probably capable of absorption as it is.

THE PYLORIC TRACT. The straight tube of Amphioxus is chiefly an absorbing organ, the digestive secretions being poured into the cavity from the liver. In the earth-inhabiting Gymnophiona and Amphisbænæ and the elongated snakes, the alimentary tract is little convoluted, since here either the process of absorption is not very rapid, or the area of the mid gut is, even when straight, considerable, relative to the total volume of the body (snakes). The mesenteron is also straight in Petromyzon and some of the sharks which lead an active carnivorous life, but the shortness is fully compensated for by an extensive folding of the inner absorbing surface through the formation of the so-called spiral fold, or spiral valve. The method of origin of the fold is seen in Petromyzon, where it is first represented by a strong, spirally twisted artery lying on the internal wall. This gradually sinks deeper and deeper toward the lumen of the gut, carrying the wall of the gut before it. As a result of this process we find a long, spirally-twisted fold projecting far inward from the wall of the gut. The fold itself is richly vascular, from the ramifications of the small blood-vessels from the artery. Such a spiral valve is found best developed in Selachians, but it exists also in Ganoids. Teleosts lack such a spiral valve, but the absorbing surface is increased by another means—namely, by out-pocketings, so-called *pyloric appendages.* That these are primarily not glands, but have an absorbing function, is indicated by two facts: (1) They are sometimes found stuffed with food, and (2) their presence seems to be correlated with the absence of the spiral valve and *vice versâ,* even in closely allied species having similar habits; and therefore it is probable that they fulfill the same office in the economy of the organism. Thus, Polypterus possesses a well-developed spiral fold, but only a few pyloric appendages, while Lepidosteus, which is provided with only a slight fold, is superabundantly provided with pyloric appendages. All of this evidence is not quite satisfactory, and it seems probable that in some cases the pyloric appendages are indeed glandular—as, for instance, when several open into the mesenteron by a common duct. Physiological studies are needed to settle this question.

The Mesenteron.—From the Amphibia on, with exceptions, the mesenteron becomes more and more convoluted externally, and at the same time the absorbing surface is increased by folds. Thus, in the frog, the anterior part of the mesenteron is covered by a fine network of folds. Further posteriorly these arrange themselves into structures like the semi-lunar valves of the heart, opening backward. Similar contrivances for increasing the internal absorbing surface are found also in reptiles and birds. In birds and mammals, when the longitudinal folds of the mesenteron are poorly developed, we find finger-like processes—*villi*—produced into the lumen of the gut. Into these folds of the mucous epithelium are continued the connective tissue of the submucosa, together with blood vessels, lymph vessels, and nerves. Food in solution is taken up by the epithelial cells just as an amœba takes it up by throwing out pseudopodia. A large share of the absorptive process is probably to be assigned to the lymph cells, which wander about in the submucosa and even make their way through the mucosa into the lumen of the gut.

Metenteron.—Like the other parts of the alimentary tract, this becomes differentiated from the common enteron only in the higher vertebrates. In the higher fishes it is indicated by an enlargement of the intestine. This enlargement is directly continuous posteriorly with the cloaca, into which also the urogenital ducts open. In Amphibia and reptiles the ventral wall of the hinder part of the metenteron is enlarged to form a (functional) urinary bladder. In Amniota the metenteron is separated from the mesenteron by an ileo-cæcal valve (q.v.). In nearly all vertebrates the metenteron—in contradistinction to mesenteron—has a straight course, hence it is often called *rectum.* In many mammals, as in man, it is greatly elongated, forming a colon ascendens, transversus, and descendens. A blind pocket or *cæcum* is often formed in connection with the metenteron and is a mere swelling in the wall in reptiles, but attains an enormous development in many birds, in which group it is usually paired. In mammals it is never so long as in birds, but is variable in extent. Thus, in herbivores it may even be as long as the body of the animal possessing it, and in some rodents it contains a spiral valve. In carnivores, on the contrary, it is poorly developed. It would seem to be somewhat compensatory with relation to the rest of the metenteron, for it is much better developed in the horse and allies which have a simple stomach than in the ruminants with a complicated one. Among certain mammals (e.g., man) the distal part of the cæcum is greatly reduced, forming the vermiform process. In man the cæcum is at first of nearly uniform character—the vermiform process arises by a degeneration of its distal end—a process which occurs relatively late. This indicates that in man the cæcum was quite recently of relatively greater importance, and indicates further that man's ancestors were herbivorous—a fact which the presence of the now degenerating third (hindermost) molar likewise confirms.

There are certain other appendages of the metenteron to which we can only refer. Such are the unpaired finger-shaped gland of the dorsal roof of the rectum in sharks, the paired dorsal pockets of Chelonia, and the unpaired bursa Fabricii of birds. The function of the last two organs is doubtful. We will digress to describe the bursa Fabricii. This is a spherical or club-shaped organ lying ventrad to the vertebral column and dorso-caudad to the rectum, to which it is attached posterio-ventrad to the urogenital opening. It arises as a solid mass, in which secondarily cavities appear, lined by epithelium from the mucosa of the metenteron. They are, therefore, not to be regarded as lymph spaces, nor the organ as a lymph organ. Its development is, therefore, much like that of the thymus gland. The organ degenerates toward the end of the first year, but persists throughout life in some species as an organ covered with a connective tissue coat, and possessing many elongated follicles lined by epithelium within. The function and phylogenetic significance of this organ are both obscure. Possibly it is homologous with the paired pockets of Chelonia; the ontogeny of these latter organs is, however, yet quite unknown.

AL'IMONY (Lat. *alimonia*, *alimonium*, nourishment, sustenance, from *alere*, to feed, nourish). In English and American law, the allowance which a married woman is entitled to receive out of her husband's estate by decree or order of the court on judicial separation or divorce *a mensa et thoro*. By Scotch legal writers the term is sometimes used as synonymous with aliment. In the United States jurisdiction with regard to alimony is conferred, in general, by statute on courts of equity. Alimony is of two sorts: *pendente lite*, and permanent. The object of the first is to enable a wife to carry on litigation with her husband, by securing her support during the pendency of suit. Should she have sufficient means of her own, no allowance would be made; the amount is fixed at the discretion of the court, and may be changed by the same authority. Permanent alimony is a periodical allowance from a husband decreed to a wife as the result of litigation in her favor. If the result be against her, no allowance is made. The amount varies with the means of the husband and the needs and position of the wife, but is usually from a third to one-half of his income, and is subject to change from time to time, as the court finds circumstances to warrant. The court may enforce its decree by contempt proceedings, and can prevent a husband from leaving the State if he means thereby to avoid payment. In some States alimony becomes a lien on the husband's real estate, or the court may compel him to give security for its prompt payment; or, in proper cases, the husband may be restrained by injunction from so disposing of his property as to place it beyond the reach of the court. See DIVORCE.

ALI PASHA, ä'lē pȧ-shä' (1741-1822). An Albanian ruler, notorious for cruelty, and known as "the Lion of Janina." He was born at Tepeleni, in the Albanian province of Janina. His father, one of the Albanian beys, died in Ali's boyhood, and the rearing of the child was thus left to his mother, a vindictive and merciless woman, who apparently instilled into him her own spirit. His youth was passed in peril and hardship, seeking to recover the possessions of which the neighboring pashas had robbed his father. Young Ali at last had to betake himself to the mountains, and even to pledge his sword to save himself from dying of hunger. At length a change came in his fortunes, and he returned to Tepeleni in triumph. On the very day of his return, he murdered his brother, and then imprisoned his mother on the charge of poisoning him. He helped the Porte to subdue the Pasha of Scutari and thereby obtained the lands taken from his father and several Greek cities. He also attacked and slew (with the permission of the Sultan) Selim, Pasha of Delvino, and, as a reward, was appointed lieutenant to the new Pasha of Dervent. He used this office to enrich himself by sharing the profits of brigandage. For this he was deposed, but he bought his way back into favor. For his services in the Turkish military forces in the war of 1787 he was named Pasha of Trikala in Thessaly; at the same time he seized Janina and had himself appointed pasha of that province. Having thus won a position of power by the most unscrupulous means, he displayed marked administrative ability. He swept his old friends, the robbers, from the mountain roads, incorporated them into military troops, quelled the wretched factions that prevailed, and everywhere introduced order in the place of anarchy by the vigor and vigilance of his administration.

Ali formed an alliance with Napoleon Bonaparte, who sent him engineers. On the collapse of the French expedition to Egypt, he seized the places which the French held in Albania. For subduing the Suliotes he was in 1804 made a governor of Rumelia. About this time, he revenged upon the inhabitants of Gardiki an injury done to his mother forty years before, by the murder of 739 male descendants of the original offenders, who themselves were all dead. In the interior of his dominions Ali maintained order and justice. Security and peace reigned, high roads were constructed, and industry flourished, so that the European travelers, with whom he willingly held intercourse, considered him an active and intelligent governor. From the year 1807, when he once more entered into an alliance with Napoleon, the dependence of Ali on the Porte was merely nominal. Having failed, however, to obtain through the influence of Napoleon, Parga, on the coast of Albania, and the Ionian Islands, he now entered into an alliance with the English, to whom he made many concessions. In return for these, they granted Parga, nominally to the Sultan, but really to Ali. As he now considered his power to be securely established, he caused the commanders of the Greek armatole (or Greek militia), who had hitherto given him assistance, to be privately assassinated one by one, while at the same time he put to death the assassins, to save himself from the suspicion of having been their instigator. The Porte at length determined to put an end to the power of this daring rebel; and in 1820 Sultan Mahmud sentenced him to be deposed. Ali resisted for a time several pashas that were sent against him; but at last surrendered, on the security of an oath that his life and property would be granted him. Regardless of this, he was put to death February 5, 1822. Ali, like many other half-civilized monarchs and chiefs who have lived within the sphere of European influence, was keenly alive to whatever occurred among the powers of Christendom. Though utterly illiterate himself, he had all the foreign journals translated and read to him. He watched every political change, as if conscious that the interests of his little region depended for their future prosperity on the west, and not on the east, and made friendly advances to both the French and English. Consult: Ibrahim Manzour Effendi, *Mémoires sur la Grèce et l'Albanie pendant le gouvernement d'Ali Pacha* (Paris, 1827); Pencker, *Die Sulioten und ihre Kriege mit Ali Pascha von Janina* (Breslau, 1834); Davenport, *The Life of Ali Pasha* (London, 1837).

AL'IQUOT PART (Lat. *aliquot*, some, several). One quantity or number is said to be an aliquot part of another when the quotient of the latter divided by the former is an integer; e.g., 2, 4, 5, 10, 12½, are aliquot parts of 100.

ALISCANS, ȧ'lĕ'skäɴ', **ALESCHANS**, or **LES ALYSCAMPS**, lā zȧ'lĕ'skäɴ' (From Lat. *Elysii Campi*, Elysian Fields). A mediæval cemetery near Arles, in the south of France, supposed to have been consecrated by an apparition of Christ himself. Hence the name of a *chanson de geste*, of the twelfth century, describing two battles fought in this place by William, Count of Orange, against the Saracens. Defeated in the first fight, he raised a new army and renewed the combat with success. The same Christian hero appears in various other *chansons* of the period.

AL'ISON, Rev. Archibald (1757-1839). An English philosophical writer. He was born in Edinburgh and studied at the University of Glasgow, and afterward at Oxford. He took orders in the Church of England, and subsequently held several preferments, among others a prebendal stall in Salisbury, and the perpetual curacy of Kenley, in Shropshire. From 1800 he officiated in a chapel in his native city, where he remained till his death. Alison is principally known by his *Essays on the Nature and Principles of Taste*, first published at Edinburgh in 1790. The *Essays* advocate what is called the "association" theory of the sublime and beautiful. Two volumes of his sermons, first published at Edinburgh in 1814, were very popular in their day, and reached the sixth edition in 1816. See Æsthetics.

ALISON, Sir Archibald (1792-1867). A British lawyer, historian, and writer. He was born at Kenley, Shropshire, December 29, 1792. In 1805 he entered Edinburgh University, where he obtained highest honors in Greek and mathematics. He was called to the bar in 1814, and, owing to friendly influence, presently made a handsome income, which enabled him to travel on the Continent, then sought by many young men who desired to visit the scenes of the wars against Napoleon. From 1822-30 he was advocate-deputy, and made his appearance as a writer on law, politics, and literature. In 1835 he settled near Glasgow, as sheriff of Lanarkshire, an office conferred on him the preceding year, and began systematic and unremitting public and literary work. His *History of Europe*, a popular rather than a profound book (10 volumes), begun in 1829, finished in 1842, achieved a great success. For the sixth edition, published in 1844, the author received 2000 guineas. By 1848, 100,000 copies had been sold in the United States. It was translated into several languages, including French, German, and even Arabic. A continuation of the *History* for the period 1815-52, 9 volumes, was completed in 1859. His other works, *Life of the Duke of Marlborough* (1845), *The Principles of Population* (1840), etc., though less successful, attracted wide notice. In 1845 he was elected Lord Rector of Marischal College, and in 1851 of Glasgow University. He was made D.C.L. of Oxford University, and in 1852 received a baronetcy. In politics he was an arch-Tory. He continued his labors, in health and strength, almost to the day of his death, May 23, 1867. Over one hundred thousand persons attended his funeral. Consult his *Autobiography*, edited by his daughter-in-law (Edinburgh, 1883).

ALISON, Sir Archibald, Jr., K.C.B. (1826—). A British general. He was born in Edinburgh, the son of the historian, and educated at Edinburgh and Glasgow Universities. He entered the army in 1846; served in the Crimean War at the siege of Sebastopol, and in India, where he lost an arm at the relief of Lucknow; and in the Ashanti expedition of 1873-74 he commanded the European brigade. He held an active command in the Egyptian expedition of 1882-83, and was promoted to be lieutenant-general for gallantry. On his return from Egypt he commanded at Aldershot in 1883-89, in 1888 was made an adjutant-general, and in 1893 retired. He published a valuable treatise on *Army Organization* (1869).

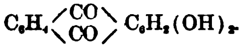
ALISON, William Pulteney, M.D. (1790-1859). A Scotch political economist, physician, and professor of the practice of medicine in the University of Edinburgh from 1822 to 1856. He was an elder brother of the historian, and was extremely popular with all classes of the community, because of his efforts to alleviate the sufferings of the poor. A pamphlet published by him in 1840 had the effect of bringing about an improved poor-law for Scotland. He published a work entitled, *A Dissertation on the Reclamation of Waste Lands* (1850), recommending the colonization of such lands by paupers and criminals, and several books upon medical subjects, among which may be mentioned his complete treatises on general pathology entitled, *Outlines of Physiology* (third edition, 1839), and *Outlines of Pathology and Practice of Medicine* (1848).

A'LITHE'A. The name of a character in Wycherley's play, *The Country Wife*, and in Garrick's *Country Girl*. She is a self-possessed and witty woman of the world.

ALIZ'ARIN (probably from Ar. *al*, the + '*aṣârah*, juice extracted from a plant), sometimes called madder extract. An exceedingly valuable coloring matter. With the oxides of aluminium, iron, and most other metals, it gives a series of beautifully colored insoluble salts or lakes. It was first obtained from madder (the root of *rubia tinctorum*) by heating with strong sulphuric acid. In 1868 Graebe and Liebermann discovered a process by which it could be manufactured from anthracene, thus for the first time artificially producing a natural coloring substance. Their method, since modified with view to economy, consists in the following operations: (1) *Anthracene*, a hydro-carbon contained in the refuse coal-tar of gas works, is oxidized with potassium bichromate to yield the compound *anthraquinone;* (2) when anthraquinone is heated with fuming sulphuric acid, *anthraquinone-sulphonic acids* are produced; (3) if the sodium salts of these acids are kept for forty-eight hours, in closed cylinders, with caustic soda and potassium chlorate, at a temperature of 180° C., the sodium salts of *alizarin* and similar compounds, called *purpurins*, are obtained; (4) the sodium salts of alizarin and purpurin are then dissolved in water, and, by addition of hydrochloric acid, alizarin itself and the purpurins are set free and precipitated in crystalline form. The precipitate is collected in filter-presses, thoroughly washed with water, and brought into the market in the form of a rather thin paste usually containing either 10 or 20 per cent. of alizarin. Pure alizarin can be readily obtained from this paste by sublimation. Alizarin was first made on an industrial scale by Perkin in 1869.

Alizarin is to some extent soluble in hot water. In the dyeing processes, fabrics are first soaked in a solution of the required mordant, and after the latter has been decomposed by steam or with alkali, leaving an insoluble metallic hydroxide in the fibre, alizarin solution is applied to produce the desired "lake."

Chemically, alizarin is a dioxy-anthraquinone, having the structural formula



$$C_6H_4\left\langle\begin{matrix}CO\\CO\end{matrix}\right\rangle C_6H_2(OH)_2.$$

Nitro-alizarin (commercial *alizarin orange*), which is itself a coloring matter, yields, when heated with glycerin and sulphuric acid, another color, *alizarin blue*, used in calico printing. *Alizarin carmine* is another important alizarin color; it is much used as a substitute for cochineal.

The artificial production of alizarin on a large industrial scale has naturally brought about important changes in the agriculture of the countries where madder used to be extensively cultivated. Consult Gnehm, *Die Anthracenfarbstoffe* (Brunswick, 1897).

AL′KAHEST, or **ALCAHEST** (a word arbitrarily formed by Paracelsus after Arabic fashion). The universal solvent of the alchemists. See Alchemy.

AL′KALIES. See Antidotes.

ALKALIES (Fr. *alkali*, ultimately from Ar. *al*, the + *ḳaly*, ashes of saltwort). A term applied to the compounds of hydrogen and oxygen with the metals lithium, sodium, potassium, rubidium, cesium, and the radical ammonium. The alkalies are all soluble in water, and have the property of neutralizing acids as well as of turning solutions of red litmus blue. The word alkal, which is derived from the Arabic, and means *ash*, was orginally given to the ashes of sea-plants, and was applied first to potash, called the *vegetable alkali*, and then to soda, which was derived from rock salt, and called *mineral alkali*. These two became known as the fixed *alkalies*, in distinction from ammonia, which was called the *volatile alkali*. The alkalies are exceedingly caustic, and act as powerful corrosive poisons. They show great avidity for acids, and combine with them, forming salts, in which the special properties of both acid and alkali are generally destroyed; hence, they are said to neutralize one another. (See Acids.) The alkalies find extensive use in the arts, as in the manufacture of soap and of baking powders, and in dyeing. The alkaline earths, lime, magnesia, baryta, and strontia, form a group of substances closely allied to the alkalies, but differing from the latter in being less soluble and by the fact that their carbonates are insoluble in water. Consult: G. Lunge, *A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali* (London, 1891); and *The Alkali-Maker's Handbook* (London, 1891).

AL′KALI FLAT. See Playa.

AL′KALIM′ETER (*alkali* + Gk. μέτρον, *metron*, measure). An instrument used for the determination of the amount of alkali contained in commercial alkalies. It is usually a glass tube graduated into parts of 100, and called a burette. To make a determination, a given weight of alkali is dissolved in water and an acid of known strength is poured from the alkalimeter into the solution until the latter is just neutralized. The exact point of neutralization is determined by means of a substance called an indicator, which changes its color when a slight excess of the acid is added. The amount of acid used determines the percentage of alkali. Consult: Hart, *A Handbook of Volumetric Analysis* (New York, 1878); Sutton, *A Systematic Handbook of Volumetric Analysis* (London, 1890).

AL′KALI SOILS. A term applied to soils occurring in regions of deficient or irregular rainfall, which contain unusually large amounts of soluble salts concentrated in or near the surface. Under certain conditions of moisture these salts appear on the surface of the soil in the form of a crust or powder known as *reh* in India, *sabach* in Egypt, and *alkali* in America. The main constituents of this saline efflorescence are sodium sulphate, sodium carbonate, and sodium chloride, mixed in varying proportions. There are present besides, according to Hilgard, salts of calcium and magnesium and smaller amounts of potassium sulphate, sodium phosphate, and sodium nitrate, these salts furnishing the most important elements of plant food. Two main classes of alkali are distinguished: "black" alkali, in which sodium carbonate predominates, and which is on this account highly corrosive and injurious to vegetation; and "white" alkali, the predominant constituent of which is sodium sulphate, and which is much less harmful to plant growth than is the black form. A saline form in which sodium chloride predominates is also frequently met with. Black alkali derives its name from the dark-colored spots which may be observed where it abounds, and which owe their color to the organic matter dissolved from the soil by the sodium carbonate.

Practically the same soluble (alkali) salts occur in all soils, but in humid regions the abundant rainfall prevents their accumulation on or near the surface, carrying away in the drainage those salts for which the soil has not a strong absorptive power. In regions of deficient rainfall, on the other hand, the scanty moisture which reaches the soil merely serves to dissolve the salts and carry them down a short distance into the ground, whence they are rapidly drawn up by the capillary rise of the water. The moisture, evaporating at the surface, leaves the salts accumulated there. Such accumulations of alkali are also found in regions which have a rainy and a dry season (as in parts of India), and where the rains occur commonly in sudden and violent downpours, which quickly pass without wetting the soil to any considerable depth.

In irrigated regions alkali frequently appears at the surface of the soil as a result of excessive application of water combined with defective drainage. Irrigation water, carried by canals running through porous, sandy soils, or applied in excessive amounts on the higher lands, seeps through to the lower-lying lands, carrying with it the soluble salts. Conditions are sometimes aggravated by the use of irrigation water rich in soluble salts.

Alkali soils generally occur in circumscribed areas ("spots"), but sometimes as broad stretches of "alkali deserts." Such soils are common in arid regions, i.e., where the average annual rainfall is less than 20 inches (500 millimetres). According to Hilgard, "the arid region thus defined, includes, in North America, most of the country lying west of the one hundredth meridian, up to the Cascade Mountains, and northward beyond the line of the United States; southward, it reaches far into Mexico, including especially the Mexican plateau. In South America it includes nearly all the Pacific Slope (Peru and Chile) south to Araucania; and eastward of the Andes the greater portion of the plains of western Brazil and Argentina. In Europe only a small portion of the Mediterranean border is included; but the entire African coast belt opposite, with the Saharan and Libyan deserts, Egypt, and Arabia are included therein, as well as a considerable portion of South Africa. In Asia, Asia Minor, Syria (with Palestine), Mesopotamia, Persia, and northwestern India up to the Ganges, and northward, the great plains or steppes of Central Asia eastward to Mongolia and western China, fall into the same category, as does also a large portion of the Australian continent." There are extensive regions, especially in European Russia, which are not strictly arid according to this definition, but in which alkali soils are of frequent occurrence.

Alkali injures plants by its corrosive action (in the case of black alkali) on the root crown, and by interference with osmotic action, by which seeds and plants take up the moisture and soil solutions, and thus prevents or seriously retards germination and growth. The latter effect results only when the soluble salts are present in considerable amount; on the other hand, a small amount of alkali appears to have a beneficial effect. Alkali, especially the black variety, also renders soils pasty and difficult to till and drain, and tends to form a tough hardpan impervious to water. Alkali soils are, as a rule, more moist than those free from a localized excess of soluble salts. This is due to the strong absorptive power of the salts for water and their retarding effect on evaporation.

Alkali soils are generally so fertile when freed from excess of noxious salts and their area is so rapidly increasing under careless methods of irrigation that the reclamation of alkali lands is a matter of the greatest agricultural importance. Alkali soils may be improved by (1) reducing surface evaporation, which may be effected by maintaining a loose tilth in the surface soil, by mulching, and by the growth of plants which root deeply and shade the soil, or which take up large amounts of soluble salts in their growth; (2) deep and thorough tillage; (3) the use of chemical correctives, such as gypsum, which in case of black alkali converts the corrosive carbonate into the comparatively harmless sulphate; and (4) leaching out the excess of salts by irrigation in connection with underdraining. The first two methods of treatment are merely temporary expedients, and are of value only when the amount of alkali is small. The third also affords only temporary relief, and is of value mainly when the amount of alkali is small and of the black variety. It is, however, very effective when employed in connection with the fourth method, for it improves the drainage, and tends to fix in the soil certain of the valuable fertilizing constituents, especially alkaline phosphates and humus, which would otherwise be lost in the subsequent leaching; for it must be borne in mind that, although the leaching process is effective in removing the noxious salts, it is likely to carry away with them a large part of those ingredients upon which the productiveness of the soil depends. The California experiment station has found that from two and a half to three times as much gypsum as there is sodium carbonate present in the soil is required in order to convert black alkali into white.

Alkali lands are commonly either entirely devoid of vegetation, or else produce plants of little or no value to man. Plants differ widely as regards tolerance of alkali in the soil, the tolerance depending much upon the kind and proportion of the salts present, as well as upon the nature of the plant itself. Hilgard proposes to utilize the natural vegetation as an index of the kind of salts predominating in a soil. Thus, under California conditions, the Samphires (*Salicornia subterminalis* and *Allenrolfea occidentalis*), Alkali-heath (*Frankenia grandifolia campestris*), and *Cressa cretica truxillensis* are especially indicative of excessive amounts of salts of any kind; Tussock grass (*Sporobolus airoides*) and Greasewood (*Sarcobatus vermiculatus*) of the presence of large amounts of black alkali; and Samphires and Saltworts (*Suæda torreyana* and *Suæda suffrutescens*) of white alkali. The natural vegetation also furnishes, according to Hilgard, a means of determining the reclaimability of alkali soils. Thus, when tussock grass, greasewood, the Samphires, Saltworts, Alkali-heath, and Cressa occupy the ground as an abundant and luxuriant growth, such land is considered irreclaimable for ordinary crops unless under-drained for the purpose of washing out surplus salts, as explained above. The more important and valuable of the plants which can withstand large amounts of alkali are the Australian salt-bushes (*Atriplex* spp.), *Modiola decumbens*, Tussock grass (*Sporobolus airoides*), Wild Millet (*Beckmannia curcæformis*), and Barnyard grass (*Panicum crus-galli*). Of ordinary farm crops which show a marked tolerance of alkali may be mentioned rice, the millets, beets, English rape, sunflowers, asparagus, celery, spinach, onion, alfalfa, Bokhara, clover, grapes. The Australian salt-bushes, especially *Atriplex semibaccata*, have recently come into considerable prominence as a useful crop for alkali soils. They are highly tolerant of alkali, taking up large amounts of the soluble salts in their growth (nearly twenty per cent. of the dry matter of salt-bushes is ash), and they produce a forage of considerable value.

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ALKALOIDS (Literally, resembling alkali). A term applied to all nitrogenous basic compounds found in plants. The alkaloids are as a rule the most important medicinal principles of the plants from which they are derived, and in moderate doses constitute therapeutic agents of the highest value. In larger quantities, however, they are extremely poisonous. Most alkaloids are chemically composed of carbon, hydrogen, nitrogen, and oxygen. A very few, including the well-known nicotine of tobacco, and coniine, contain carbon, hydrogen, and nitrogen, but no oxygen. The alkaloids that contain oxygen are non-volatile solids, and can mostly be obtained in the form of colorless crystals. Those that contain no oxygen are volatile liquids. The separation of the two groups of alkaloids can therefore be readily effected by simply subjecting the given mixture to a process of distillation.

Many alkaloids are chemically related to the organic bases called *pyridine* and *quinoline* (qq.v.). Thus coniine, nicotine, piperine, atropine, cocaine, and others have been shown to be derivatives of pyridine; quinine, cinchonine, strychnine, brucine, etc., have been shown to be derivatives of quinoline. Other alkaloids, including caffeine, or theine, and theobromine, are related to uric acid. In contradistinction to these true, or *natural alkaloids*, a certain number of substances not found ready-formed in nature, but prepared artificially in the chemical laboratory, have been termed *artificial alkaloids*. Antipyrine, kairine, thalline, and the ordinary acet-anilide, or antifebrine, are examples of artificial alkaloids, which resemble the natural alkaloids both in their chemical constitution and physiological action. Of the natural alkaloids but very few have as yet been reproduced artificially. Another few, including atropine and cocaine, have been reconstructed from their decomposition products.

The separation and detection of the several alkaloids is often a matter of great importance in medico-legal examinations. The analytical method usually employed (the so-called Stas-Otto method) consists in partially separating the given mixture by the use of water, alcohol, ether, chloroform, benzine, and amyl alcohol, then applying tests depending upon the characteristic reactions of the various constituents. Tannic, picric, and phospho-molybdic acids, potassium-mercuric iodide, and a few other reagents form insoluble precipitates with the alkaloids.

The following are the more important natural alkaloids, their characteristic properties, and the sources from which they are obtained:

Aconitine, $C_{33}H_{43}NO_{12}$; melting point, 184° C.; insoluble in water; soluble in alcohol, ether, and chloroform; a violet coloration is produced when its solution in phosphoric acid is cautiously evaporated. It is found in aconite, the tuber of *Aconitum napellus* Linné.

Atropine, or *Daturine*, $C_{17}H_{23}NO_3$; melting point, 115° C.; soluble in alcohol and chloroform; sparingly soluble in hot water and in ether. It does not exist ready-formed in nature, but is produced by the transformation of the alkaloid hyoscyamine.

Berberine, $C_{20}H_{17}NO_4+4.5H_2O$; melting point, 120° C.; soluble in hot water or alcohol; its aqueous solution is colored red by chlorine. It is found in yellow puccoon, the rhizome and roots of *Hydrastis canadensis* Linné; also, in Canadian moonseed, the rhizome and roots of *Menispermum canadense* Linné, and in other plants.

Brucine, $C_{23}H_{26}N_2O_4+4H_2O$; melting point, 100° C.; soluble in alcohol and in chlorofrom. It imparts to strong nitric acid a red coloration that gradually changes to yellow; the coloration becomes violet on addition of stannous chloride. It is found, along with strychnine, in nux vomica.

Caffeine, or *Theine*, $C_8H_{10}N_4O_2$; melting point, 230.5° C.; soluble in hot water and in chloroform; sparingly soluble in hot alcohol. If its solution in chlorine water is evaporated and ammonia added to the residue, the latter turns purple. It is found in many plants and is contained in considerable quantities in tea and coffee.

Cinchonidine, $C_{19}H_{22}N_2O$; melting point, 200.5° C.; soluble in chloroform and in alcohol. It is lævo-rotatory (i.e., its solutions turn the plane of polarized light to the left). It is found along with quinine in cinchona bark.

Cinchonine, $C_{19}H_{22}N_2O$ (hence, isomeric with cinchonidine); melting point, about 240° C.; sparingly soluble in chloroform and in hot alcohol. It is dextro-rotatory and is found in cinchona bark.

Cocaine, $C_{17}H_{21}NO_4$; melting point, 98° C.; soluble in alcohol and in ether; sparingly soluble in water. It produces local anæsthesia when injected subcutaneously or applied to mucous membranes. It is found in coca, or cuca, the leaves of *Erythroxylon coca* Lamarck.

Codeine, $C_{13}H_{21}NO_3$; melting point, 155° C.; soluble in alcohol, chloroform and ether. With strong sulphuric acid and chloride of iron it gives a blue coloration. It is one of the alkaloids contained in opium.

Colchicine, $C_{17}H_{23}NO_6$; melting point, 145° C.; soluble in water, alcohol and chloroform. It imparts to strong nitric acid a violet color which gradually turns brown. It is the active principle of colchicum root, the corm of *Colchicum autumnale* Linné.

Coniine, $C_8H_{17}N$; boiling point, 168.5° C.; soluble in alcohol, ether, and chloroform; sparingly soluble in water. Its aqueous solution gives a brown precipitate with a solution of iodine. Coniine has dextro-rotatory power. It is the active principle of hemlock, the fruit of *Conium maculatum* Linné.

Curarine. $C_{18}H_{35}N$ (or $C_{10}H_{15}N$?); a yellow powder, soluble in water and in alcohol; turns purple if treated with strong hydrochloric acid. It is the active principle of the South American arrow poison curare, which is made from certain plants, including species of *Strychnos*.

Daturine, see Atropine, above.

Emetine, $C_{30}H_{40}NO_5$ (or $C_{30}H_{40}N_2O_5$?); melting point, 62°—65° C.; soluble in alcohol, ether, and chloroform; gives with a solution of sodium molybdate in strong sulphuric acid a brown coloration which turns blue on addition of hydrochloric acid. It is the active principle of ipecac, the root of *Cephaëlis ipecacuanha*.

Eserine, or *Physostigmine*, $C_{15}H_{21}N_3O_2$; melting point, 40°—45° C.; soluble in alcohol, ether, and chloroform; bleaching powder colors its solution red, but the color disappears again on addition of an excess of bleaching powder. It is the active principle of Calabar bean, the seed of *Physostigma venenosum* Balfour.

Hyoscyamine, $C_{17}H_{23}NO_3$; melting point, 108.5° C.; soluble in water, alcohol, ether, and chloroform; gives a purple color with strong nitric acid. By the action of caustic alkalies it is readily transformed into the alkaloid atropine (see above). Hyoscyamine is found in many plants of the natural order *Solanaceæ; e.g.*, in henbane, the leaves and flowering tops of *Hyoscyamus niger* Linné, and in the leaves of *Atropa belladonna* Linné.

Morphine, $C_{17}H_{19}NO_3$; melting point, 230° C.; It may be extracted from alkaline solutions by means of chloroform. With strong nitric acid it gives a blood-red coloration that gradually turns yellow. It is one of the constituents of opium.

Muscarine, $C_5H_{15}NO_3$; a liquid soluble in water and in alcohol; insoluble in ether and chloroform. It is found in the fly fungus, *Amanita muscaria*.

Narceine, $C_{23}H_{29}NO_9$; melting point, 145.2° C.; sparingly soluble in the ordinary solvents. A solution of sodium molybdate in strong sulphuric acid gives a green coloration that turns dark-red. It is one of the constituents of opium, and resembles morphine in its physiological action.

Narcotine, $C_{22}H_{23}NO_7$; melting point, 176°; soluble in chloroform, less soluble in hot alcohol and ether. Its solutions are lævo-rotatory, but when acidified turn the plane of polarized light to the right. It is one of the constituents of opium.

Nicotine, $C_{10}H_{14}N_2$; boiling point, 241° C.; soluble in water, alcohol, and ether; its smell and taste are like those of tobacco. With hydrochloric acid it gives a violet coloration that turns orange on addition of nitric acid; with iodine solutions it gives a yellow precipitate. It is the active principle of tobacco, the dried leaves of *Nicotiana tabacum;* tobacco smoke, however, contains no nicotine.

Papaverine, $C_{20}H_{21}NO_4$; melting point, 147° C.; soluble in hot alcohol and in chloroform; gives a violet coloration with strong sulphuric acid. It is found in opium.

Physostigmine, see Eserine, above.

Pilocarpine, $C_{11}H_{16}N_2O_2$; a semi-fluid alkaloid soluble in alcohol, ether, and chloroform; gives a green coloration with strong sulphuric acid and potassium bi-chromate. It is one of the active principles of pilocarpus, or jaborandi, the leaflets of *Pilocarpus selloanus* Engler, or of *Pilocarpus jaborandi* Holmes.

Piperidine, $C_5H_{11}N$; a liquid alkaloid produced by the decomposition of piperine, a substance found in pepper.

Piperine, $C_{17}H_{19}NO_3$; melting point, 128° C.; soluble in hot water and in chloroform; with strong sulphuric acid it gives a yellow color that changes to brown, then to a greenish brown. It is found in plants of the natural order *Piperaceæ*, and is one of the chief constituents of ordinary black pepper.

Quinidine, $C_{20}H_{24}N_2O_2$; melting point, 168° C.; soluble in chloroform, less so in alcohol and ether; sparingly soluble in water; its solution turns the plane of polarized light to the right. It is found in cinchona bark.

Quinine, $C_{20}H_{21}N_2O_2 + 3H_2O$; melts in its water of crystallization at 57° C., loses its water at 100°, then melts again at 177° C.; soluble in alcohol, ether and chloroform, sparingly soluble in water; its solutions turn the plane of polarized light to the left. It is found in cinchona bark.

Solanine, $C_{43}H_{75}NO_{15}$; melting point, 235° C.; it may be extracted from its alkaline solutions by means of chloroform; with strong sulphuric acid it gives an orange coloration that turns a brownish red. It is found in bittersweet (woody nightshade), the young branches of *Solanum dulcamara* Linné.

Strychnine. $C_{21}H_{22}N_2O_2$; melting point, about 264° C.; soluble in chloroform and in hot alcohol; sparingly soluble in water and in ether. It gives a pretty display of colors with strong sulphuric acid and a grain of potassium bi-chromate. It is found in plants of the natural order *Loganiaceæ*, and is usually obtained from nux vomica.

Thebaine, or *Paramorphine*, $C_{19}H_{21}NO_3$; melting point, 193° C.; soluble in alcohol and chloroform; gives, with strong sulphuric acid, a dark-red coloration which turns yellow. It is found in opium.

Theine, see Caffeine, above.

Theobromine, $C_7H_8N_4O_2$; sublimes without melting at 290° C.; sparingly soluble in the ordinary solvents; may be extracted from an alkaline solution by means of chloroform. On evaporation with chlorine-water a brown residue is obtained that turns purple if a little ammonia is added. It is found in cacao beans.

Veratrine, $C_{32}H_{49}N_6O_9$; a mixture of two isomeric alkaloids; melting point, 155° C.; soluble in alcohol, ether, and chloroform; gives a red coloration if heated with strong sulphuric or with fuming hydrochloric acid. It is found in the seed of *Asagræa officinalis* Lindley.

The extraction of an alkaloid from the plant in which it occurs is often a matter of considerable difficulty. The volatile alkaloids may be obtained by distilling the plant or vegetable product with water and lime (or caustic soda); the liquid distilling over is neutralized with sulphuric acid and evaporated to dryness; the sulphate of the alkaloid may then be dissolved out of the residue by means of a mixture of alcohol and ether. To extract a non-volatile alkaloid, the plant is macerated and treated with a dilute solution of some acid in ordinary alcohol; the solution thus obtained is rendered alkaline by the addition of soda, and the alkaloid set free is either directly obtained in the form of a precipitate, or else may be extracted from the alkaline solution by means of ether, chloroform, or some other solvent that does not mix with water. Such processes, however, usually yield not one single, but mixtures of two or more alkaloids, and those contaminated with large quantities of other organic substances, which often render the isolation of a single alkaloid in the pure state very difficult.

As to the chemical constitution of alkaloids, very little is as yet known. It has been found, however, that most of these substances are tertiary aromatic bases, and that by far the greater number of them contain one or more methoxy-groups, OCH_3, linked to a benzene nucleus. The chemical relationship of the alkaloids to pyridine, quinoline, and uric acid, has been mentioned above. Most alkaloids have a powerful physiological action even if employed in very small quantities. The action of certain alkaloids is, however, at least partly antagonistic to the action of certain others. For this reason one alkaloid may sometimes be employed to relieve the poisonous effect of another alkaloid, though it may itself be a violent poison. The antagonism of morphine and atropine is of considerable value in cases in which a subcutaneous injection of morphine is indicated: the cardiac depression, indigestion, and constipation, usually caused by morphine, may be prevented by injecting simultaneously a trace of atropine.

The alkaloids are sometimes spoken of as vegetable bases, natural organic bases, or vegetable alkaloids. The latter name is applied to them in contradistinction to the animal alkaloids, or *ptomaines*, that are formed during the putrefaction of animal products. Like the vegetable alkaloids, the ptomaines are highly poisonous nitrogenous bases, and they resemble the vegetable alkaloids both in their chemical properties and in their physiological action. See Ptomaines.

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AL'KANET (dim. of Sp. *alcana*, *alheña*, from Ar. *al*, the + *hinnâ*), *Anchusa*. A genus of plants belonging to the natural order Boraginaceæ. The species are herbaceous plants, rough with stiff hairs, and having lanceolate or ovate leaves, and spike-like, bracteated, lateral, and terminal racemes of flowers, which very much resemble those of the species of Myosotis, or forget-me-not. The common alkanet (*Anchusa officinalis*) grows in dry and sandy places, and by waysides, in the middle and north of Europe. It is rare and a very doubtful native in Great Britain. The flowers are of a deep purple color. The roots, leaves, and flowers were formerly used in medicine as an emollient, cooling, and soothing application. The Evergreen Alkanet (*Anchusa sempervirens*) is also a native of Europe, and a doubtful native of Great Britain, although not uncommon in situations to which it may have escaped from gardens, being often cultivated for the sake of its beautiful blue flowers, which appear early in the season, and for its leaves, which retain a pleasing verdure all winter. It is a plant of humble growth, rising only a few inches above the ground. A number of other species are occasionally seen in our flower borders. Anchusa tinctoria, to which the name Alkanet or Alkanna (Ar. *al-chenneh*) more strictly belongs, is a native of the Levant and of the south of Europe, extending as far north as Hungary. The root is sold under the name of alkanet or alkanna root; it is sometimes cultivated in England; but the greater part is imported from the Levant or the south of France. It appears in commerce in pieces of the thickness of a quill or of the finger, the rind blackish externally, but internally of a beautiful dark-red color, and adhering rather loosely to the whitish heart. It contains chiefly a resinous red coloring matter, to which the name alkanet is often applied. (See Alkanet below.) Virginian alkanet is probably a species of the genus Lithospermum.

ALKANET. A beautiful red coloring matter obtained from the roots of the alkanet or orchanet herb (*Anchusa tinctoria*, Tausch.) and largely used for imparting a red color to varnishes, cosmetics, etc. It is extracted from the roots by means of benzine, and, on evaporating the latter, is obtained in the form of a thick paste that is insoluble in water, but readily soluble in alcohol, ether, benzine, various oils, and other organic liquids. Alkanet should not be confounded with the red coloring matter contained in the roots of the henna, or alcanna, plant (*Lawsonia inermis* L.). The chemical composition of purified alkanet seems to correspond to the formula $C_{15}H_{14}O_4$.

AL'KEKEN'GI. See Physalis.

AL-KHUWARIZMI, ȧl-kü'wȧ-rĭz'mė, Abu 'Abd Allah Mohammed ibn Musa, of Khwarezm, a medieval State included in the present Khanate of Khiva (?-c.831). A Moslem philosopher and celebrated algebraist. He was one of the savants who went to Bagdad in Al-Mamun's reign. He worked in the observatory there, computed a set of astronomical tables and wrote several works on mathematics. Among these works were treatises on the Hindu arithmetic (transl. Gerard of Cremona, or Adelard of Bath; published by Boncompagni, Rome, 1857), the sun-dial, the astrolabe (an instrument used to take the altitude of the sun), on chronology, geometry, and algebra. His *Al-jabr wa'l muqabalah*, i.e. the redintegration and the comparison, gave the name to algebra (q.v.). His discussion of the quadratic equation, in which he called to his assistance geometric diagrams, is quite complete. His name appeared in Latin in the form Algoritmi, from which we have our word algorism (q.v.). His algebra was translated into Latin by Gerard of Cremona, and into English by F. Rosen (London, 1831). Consult Brockelmann, *Geschichte der arabischen Litteratur* (Weimar, 1898, part i., p. 215).

AL-KINDI, ȧl-kēn'dė, or **ALCHINDIUS**, ăl-kĭn'dĭ-ŭs, Abu Yusuf Ya'ḳub ibn Isḥak al-Kindi. An Arabian philosopher, who flourished in the ninth century. He wrote more than two hundred treatises on almost everything within the range of the philosophy and science of his time. By the Arabs themselves he is viewed as the Peripatetic philosopher in Islam. Of his many works, but a few on medicine and astrology remain. Consult the study by Flügel (Leipzig, 1857), and A. Nagy, *Die philosophischen Abhandlungen des al-Kindi* (Münster, 1897).

ALKMAAR, ȧlk-mär'. An old town in the province of North Holland, in the Netherlands, situated on the North Holland Canal, 20 miles northwest of Amsterdam (Map: Netherlands, C 2). It is well built, has very clean streets, and is intersected by broad canals. It possesses a town-house, ornamented with curious Gothic carving, with a tower, a museum of antiquities, and a library, and the church of St. Laurence, which dates from the fifteenth century. The inhabitants support themselves by important manufactures of sail-cloth, sea-salt, etc., as well as by trade in grain, butter, and cheese. Alkmaar exports great quantities of the last mentioned commodity, more than 5000 tons being brought into the town yearly, or over one-half the output of the province. It is the birthplace of Henry of Alkmaar. (See ALKMAAR, HEINRICH VON.) Alkmaar, first of all the Netherland cities, successfully resisted the Spanish in 1573, and the anniversary of that siege was commemorated in 1873 by the erection of a statue of Victory, by Stracké. Here, on October 18, 1799, the Duke of York signed a not very honorable capitulation, after his Russo-British army had been twice defeated by the French general Brune. Pop., 1890, 15,803; 1900, 18,275.

ALKMAAR, HEINRICH VON. A Low German translator or adapter of an animal epic, *Reynard the Fox* (q.v.), printed in 1498. Alkmaar is said to have been a tutor of the Duke of Lorraine in the latter part of the fifteenth century.

AL′KOREM′MI. In William Beckford's romance of *Vathek* (q.v.), the name of Vathek's palace, to which he had added five parts, corresponding to his five senses.

AL′LA, or **EL′LA.** In Chaucer's *Man of Law's Tale*, the name of the king who marries Constance.

ALLA BREVE, äl′lȧ brā′vȧ (It. according to the *breve*). In music, a species of common time with a quick movement. In early ecclesiastical music, we find no terms indicating the tempo or rate of movement, until, in the fifteenth century, the expressions *augmentation* and *diminution* were introduced to indicate that note-values were to be changed by lengthening or shortening. The sign of diminution was a vertical line drawn through the time signature; ⌽ for triple and 𝄵 for duple time. With this diminution, breves (q.v.) were to be taken in the time of semi-breves, thus quickening the movement. At that time the unit of count was a semi-breve. When the breve was "diminished," it meant that one must count "by the breve," hence the name Alla Breve.

In modern music Alla Breve measure (sometimes called Alla Cappella) is marked 𝄵 or $\frac{2}{2}$ and calls for two counts to the bar, with half notes as the unit. See MENSURABLE MUSIC.

AL′LAH. The Mohammedan name for God, contracted from the Arabic *al ilah*, the God.

ALLAHABAD, äl′lȧ-hȧ-bäd′. A district and a division of the North-West Provinces, British India.

ALLAHABAD (Ar. *Allah*, God + Hind. *abad*, city, dwelling). The seat of the government of the North-West Provinces of British India (Map: India, D 3). It occupies the fork of the Ganges and Jumna which forms the lowest extremity of the extensive region distinguished as the Doab, or the Country of Two Rivers, lying between those natural boundaries. Its position at the confluence of the holy rivers, which has long made it a centre of superstitious reverence and worship, and a much frequented place of pilgrimage for the purposes of ablution, also rendered it a natural centre of commerce and civilization, an advantage which has been fully appreciated by the British Government. It commands the navigation both of the Ganges and of the Jumna. It is on the direct water route between Calcutta and the Upper Provinces, and is a main station on the Grand Trunk Road, and also on the East Indian Railway. Allahabad stands 72 miles west of Benares; is distant from Calcutta, by land, 496 miles; by water, 808 miles in the rainy season, 985 miles in the dry season. From Delhi it is distant 386 miles, and from Bombay, by the Jabalpur branch of the East Indian Railway, 840 miles. The cotton, sugar, and indigo produce of the fertile district of Allahabad is brought in large quantities into the city, to be transported thence to Calcutta and elsewhere. Steamers sail to Calcutta and barges to Delhi.

In point of appearance, Allahabad is scarcely worthy of its character and renown. With the exception of a few ancient monuments of costly, elaborate, and tasteful workmanship, the native part of the city consists of mean houses and narrow streets. The most noteworthy buildings are the Jumma Musjid, or the great mosque, and the Sultan Khossor's caravansary—a fine cloistered quadrangle. The fort is of red stone, and is approached by a very handsome gate; it contains the palace or residency, and the famous Asoka or Gada Pillar, the club of Bhin Sen, 240 B.C. Below the fort, built over "the undying banyan tree," is the subterranean Chali Satum temple, which is said to communicate with Benares by an underground passage, through which flows a third holy river, the Sereswati, visible only to the eye of faith, the dropping moisture on the rocky walls pointed out as the river scarcely justifying the presumption. Allahabad possesses a hospital, theatres, bazaars, etc., and the Muir Central College, the chief educational institution in the North-West Provinces. (See the article INDIA.) As generally in the towns of India, the European quarter is vastly superior. Its nucleus appears to have been the native fort, which on the east and south rises directly from the banks of both rivers, while toward the land its artificial defenses, of great strength in themselves, are not commanded from the neighborhood by any higher ground. This citadel, described by Heber as having been at one time "a very noble castle," has lost much of its romance by having had its lofty towers pruned down to bastions and cavaliers. The Europeans of the garrison occupy well-constructed barracks. Beyond the fort are the cantonments for the native troops. In connection with these are numerous villas and bungalows, few other spots in India boasting such handsome buildings of this kind, which are rendered still more attractive and agreeable by avenues of trees winding between them and connecting them with the fort, the city, and several of the adjacent localities. Two boat bridges cross the Ganges, and the East Indian railway-bridge spans the Jumna at Allahabad. So many poor pilgrims throng the city, especially at the time of the great annual religious fair, that instead of Allahabad, the natives call it "Fakirabad," or the city of beggars. From the octroi, professional and carriage taxes, rents and proceeds of the Hindu fair, a considerable municipal revenue accrues, which is expended on police, lighting, street sprinkling, water works, maintenance of parks, medical assistance, and charities. Allahabad was founded by Akbar in 1575, on the site of an ancient fort. From 1765 to 1801 it underwent three changes of rulers, finally coming under British domination. The mutiny of 1857 brought disaster to Allahabad. On the 6th of June of that year, the insurrection, which had begun at Meerut on the 10th of May, extended itself to Allahabad. Though the Europeans held the fort, the mutineers were for some days undisputed masters of all beyond; and between the ravages of the marauders and the fire of the garrison, the city became little better than a heap of blackened ruins. New buildings began to spring up as soon as order had been restored, and most of the city has been rebuilt since that date, with the exception of the few monuments of ancient native architecture described above. Pop., 1891, 175,250; 1901, 172,-032.

ALLAIN-TARGÉ, ȧ'lăN' tär'zhȧ', François Henri René (1832-1902). A French politician, born at Angers. He studied law at Poitiers, was admitted to the bar in 1853, and from 1861 to 1864 was substitute imperial procurator at Angers. From 1864 to 1866 he was an editor of the *Courrier du Dimanche*. He joined the staff of the *Avenir National* in 1868, and in the same year founded the *Revue Politique*. Upon the fall of the Empire, he was appointed by the Government for national defense prefect of the department of Maine-et-Loire. He was subsequently an army commissary, and resigned with Gambetta upon the conclusion of peace. He was a municipal councillor of Paris in 1871 and 1874, deputy in 1876, 1877, and 1881, and Minister of Finance in Gambetta's cabinet. In 1885-86 he was Minister of the Interior in the cabinet of Brisson.

AL'LAMAN'DA (Named after the Swiss scientist Allamand, who died in 1787). A genus of plants of the natural order Apocynaceæ. It is distinguished by a quinque-partite calyx without glands, by a funnel-shaped corolla, and by the prickly capsular fruit pod. Allamanda cathartica, a native of the West Indies, is a climber with whorled or opposite oblong leaves, and golden-yellow flowers, white marked in the throat. It has violently emetic and purgative properties; but in small doses an infusion of the leaves is esteemed a valuable cathartic medicine, especially in the cure of painters' colic. All the species, of which there are about twelve, are natives of the tropical parts of America. Specimens of Allamanda are often seen in greenhouses, where it is a showy plant both in leaf and in flower. Among the shrubby species are Allamanda neriifolia and Allamanda grandiflora, while Allamanda schottii, Allamanda nobilis, and Allamanda cathartica are the best known climbers.

ALLAN, ăl'lan, David (1744-96). A distinguished Scottish painter of domestic subjects, in which he was the forerunner of Wilkie. He was born at Alloa, February 13, 1744. In 1755, he entered the academy for drawing, painting, and engraving established in Glasgow by the celebrated printer Foulis, where he studied for seven years. The liberality of friends enabled him, in 1764, to go to Rome, where he resided for thirteen years. In 1773, he gained the gold medal given by the Academy of St. Luke for the best historical composition. The subject was the "Origin of Painting," the old legend of the Corinthian maid who drew her lover's profile from the shadow. This picture, the highest effort of Allan's powers, was engraved by Cunego. Of his other pictures executed at Rome, the best known are four humorous pieces illustrating the carnival, which were engraved by Paul Sandby. In 1777, Allan came to London, where he painted portraits; three years later, he removed to Edinburgh; and in 1786, succeeded Runciman at the head of the Trustees' Academy. His works after this were chiefly of a humorous description, and illustrative of Scottish domestic life. His illustrations of Allan Ramsay's *Gentle Shepherd* became very popular, but are of no great merit. Allan died at Edinburgh, August 6, 1796. "His merits," says Allan Cunningham, "are of a limited nature; he neither excelled in fine drawing, nor in harmonious coloring; and grace and grandeur were beyond his reach. His genius lay in expression, especially in grave humor and open drollery."

ALLAN, Sir Hugh (1810-82). A Canadian ship-owner. He went from Scotland to Canada as a clerk in 1826, and in 1835 became a shipbuilder and commission merchant. During the Canadian rebellion of 1837-38, he served in the army as a volunteer, and reached the rank of captain. He helped establish, after many disasters, the Allan Line of screw steamships, and was one of the projectors of the Canadian Pacific Railway, and obtained prominence in the scandal connected with that road. Many transportation, manufacturing, and mining companies owed their success largely to his enterprise. He received the honor of knighthood in 1871, for his service to commerce. He was one of the wealthiest men in Canada.

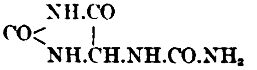
ALLAN, Sir William (1782-1850). A Scotch painter. He was born in Edinburgh, and studied art in the Trustees' Academy there, and in the schools of the Royal Academy, London. In 1805 he went to Saint Petersburg, and spent several years in various parts of Russia and Turkey, where he acquired material for his first successful pictures. Returning to Scotland in 1814, he devoted himself to Scottish historical painting. This part of his work includes "John Knox Admonishing Queen Mary" (1823), "Queen Mary signing her Abdication" (1824), and the "Death of the Regent Murray" (1825), which made him an A.R.A. In 1834 he returned to his earlier subjects, and his "Polish Exiles on their Way to Siberia" and "The Moorish Love-Letter" won him a seat in the Royal Academy. Later pictures were "A Slave-Market in Constantinople" (1837), "The Battle of Prestonpans" (1842), "Waterloo," from the English side (1844, bought by the Duke of Wellington), "Peter the Great teaching Shipbuilding to his Subjects" (ordered by the Czar, 1845). Allan became president of the Royal Scottish Academy in 1838, in 1841 succeeded Wilkie as limner to the Queen in Scotland, and was knighted in 1842.

AL'LANITE. A mineral silicate of the epidote group containing iron, calcium, aluminium, and the rare metals caesium, neodymium, praseodymium, lanthanium, and yttrium. It occurs in black or dark brown crystals with submetallic or resinous lustre and exhibiting strong pleochroism. It is found as an accessory mineral in many basic crystalline rocks and is frequently associated with masses of magnetic iron ore.

ALLAN'TOÏN (Ultimately derived from *allantois*), $C_4H_6N_4O_3$. An organic substance found in the allantoic and amniotic fluids, in fœtal urine, and in the urine of many animals during a short time after birth. It is a crystalline, solid substance, sparingly soluble in cold water, but dissolving readily in hot water or alcohol, and in solutions of alkaline carbonates. It may be obtained from the urine of calves by evaporating and letting stand, at ordinary temperatures, until the substance crystallizes out. Chemically, allantoïn is the di-ureide of glyoxylic acid. It is one of the most important products of the oxidation of uric acid (allantoïn is found in urine after uric acid has been taken internally), and, on the other hand, it may be readily made from urea by prolonged heating with glyoxylic acid. When uric acid is oxidized with potassium permanganate, allantoïn is formed, according to the following chemical equation:

$$C_5H_4N_4O_3 + O + H_2O = C_4H_6N_4O_3 + CO_2.$$

The graphic formula of allantoïn is



$$CO\!<\!\begin{array}{l}NH.CO\\ \qquad\;\;|\\ NH.CH.NH.CO.NH_2\end{array}$$

Allantoïn was first discovered in 1790 by Vauquelin. See URIC ACID.

ALLAN'TOÏS (Gk. *ἀλλᾶς*, *allas*, a sausage, and *εἶδος*, *eidos*, shape). A delicate membranous bag, which makes its appearance in the eggs of birds during incubation, and is a provision chiefly for the aëration of the blood of the embryo or chick. It sprouts from the lower part of the intestine of the chick, and rapidly enlarges, so as almost completely to inclose it, lining nearly the whole extent of the membrana putaminis—the double membrane which is immediately within the egg-shell. It is covered with a network of arteries and veins, corresponding to the umbilical artery and vein of mammalia; and the aëration of the blood is accomplished by the air which enters through the pores of the shell; but as the lungs become capable of their function, the circulation in the allantoïs diminishes, and its footstalk contracts, and at last divides, leaving only a ligamentous remnant. The allantoïs is never developed in the eggs of fishes and amphibians, hence these are called anallantoid vertebrates; while reptiles, birds, and mammalia, in which it is present, are called allantoid. In the mammalia, it is superseded at an early period of fœtal life by other contrivances, but continues to exist in the lower animals for receiving the urinary secretion through the urachus, a purpose which it serves in birds and reptiles likewise. In the human species, it disappears very early, only a minute vesicle remaining. See EMBRYOLOGY.

ALLAR, ȧ'lär', ANDRÉ JOSEPH (1845—). A French sculptor, born at Toulon. He was a pupil of Dantan, Guillaume, and Cavelier at Paris, where he obtained the Grand Prix de Rome in 1889. He is a frequent exhibitor at the Salon, among his most celebrated productions being: "Hécube et Polydore" (1873), "Sainte Cécile" (1874), "La Tentation" (1876), "L'Éloquence" (1878, executed for the church of Sorbonne), and "Jeanne d'Arc à Domrémy" (1884). The statues of Jean Bullant and Jean Goujon for the façade of the Hôtel de Ville at Paris were also executed by him.

ALLARD, ȧ'lär', JEAN FRANÇOIS (1783-1839). Generalissimo of the army of Lahore, and previously adjutant to Marshal Brune under Napoleon. After the murder of Marshal Brune (q.v.), Allard left France (1815), intending to emigrate to America, but changed his plan, entered into the service of Abbas-Mirza of Persia, and afterward went to Lahore (1820), where he engaged in the service of Ranjit Singh (q.v.), by whom he was made generalissimo, and whose forces he organized and trained in the European modes of warfare. He married a native of Lahore, and identified himself with the interests of his adopted country, but could not entirely forget France. The changed political situation after the revolution of 1830 brought him back to Paris (1836), where he was received with distinction, and was made French *chargé d'affaires* in Lahore. He presented to the royal library of Paris a valuable collection of coins, and returned to Lahore, leaving his wife and children in Paris. He distinguished himself in the Sikh campaigns against the Afghans, and died at Peshawar, January 23, 1839. His remains were, according to his own wish, buried with military honors at Lahore.

ALLA'TIUS, LEO (1586-1669). A Greek ecclesiastic of the Roman Catholic Church. He was born on the Island of Chios, removed in 1600 to Rome, and studied at the Greek College there. He was appointed grand-vicar to the Bishop of Anglona, and was sent in 1622 by Gregory XV. to bring to Rome the Palatinate, or Heidelberg, library. In 1661 he was appointed by Alexander VII. librarian of the Vatican. He tried to reconcile the Western and Eastern Churches, writing such treatises as *De Ecclesiæ Occidentalis atque Orientalis Perpetua Consensione* (1648), and *De Utriusque Ecclesiæ in Dogmate de Purgatorio Consensione* (1655). His further works include *De Libris Ecclesiasticis Græcorum* (1645), and *Græciæ Orthodoxæ Scriptores* (1652).

ALLÉE VERTE, ȧ'lȧ'vârt' (Fr., green walk). A famous promenade at Brussels (q.v.), formed by an avenue of lime trees.

AL'LEGAN. A village and county seat of Allegan Co., Mich., 33 miles south of Grand Rapids, on the Lake Shore and Michigan Southern, the Pere Marquette, and the Michigan Central railroads, and on the Kalamazoo River (Map: Michigan, H 6). It contains a public library and fine court house, city hall, and public school buildings. The village is in a fertile agricultural and fruit-growing region, and has valuable natural advantages in good water power, derived by means of two dams, one in the village and the other on the river, three miles above the village. Power from the latter is transmitted for a considerable distance. The industrial establishments include, among others, paper, planing, and flour mills, furniture factories, carriage works, casket factories, foundry and machine shop, etc. Allegan was settled in 1835, and was first incorporated in 1838 and reincorporated in 1858. The water-works are owned and operated by the village. Pop., 1890, 2669; 1900, 2667; 1904, 2795.

AL'LEGA'NY. A town in Cattaraugus Co., N. Y., 58 miles (direct) southeast of Buffalo, on the Allegheny River and the Erie Railroad (Map: New York, B 3). The town is engaged in the oil industry, and has a tannery, a canning factory, and saw mills, and is the site of St. Bonaventure's College, a Roman Catholic institution, organized in 1859. The village of Alleghany was incorporated in 1905. Population (town), 1890, 3611; 1900, 3692; 1905, 3554. Population (village), 1905, 1330.

ALLEGHANIES. A mountain range of Pennsylvania, Maryland, West Virginia, and Virginia, lying west of the Blue and Blue Ridge ranges, and having the same direction, northeast to southwest (Map: United States, Eastern Part, K 3). Rich mines of coal and iron have been so highly developed as to make the adjoining regions the greatest in the world in coal mining and in the manufacture of iron and steel products. The term Alleghanies is sometimes incorrectly extended to include the whole Appalachian system, of which it is a part. See APPALACHIANS.

ALLEGHANY SPRINGS. A health resort in Montgomery Co., Va., on the Norfolk and Western Railroad; noted for its medicinal springs (Map: Virginia, D 4). There are also in this locality several other mineral springs, notably the Montgomery White Sulphur and the Yellow Sulphur Springs.

ALLEGHENY. An important manufacturing city, in Allegheny Co., Pa., on the north bank of the Allegheny and Ohio rivers, opposite Pittsburg (Map: Pennsylvania, A 3). Connected by several large bridges, affording ample facilities for communication, the two cities form one industrial and social community. Allegheny is the terminus of the Western Pennsylvania, the Pittsburg and Western, and the Buffalo, Rochester, and Pittsburg; and is on the Pittsburg, Fort Wayne, and Chicago, the Cleveland and Pittsburg, the Pittsburg and Erie, and the Pittsburg and New Castle, all of which belong to the western division of the Pennsylvania system. Electric street railways connect with Pittsburg and neighboring towns.

The city is on hilly ground, and covers about twelve square miles. The two most prominent buildings are the city hall and the public library, at the crossing of Ohio and Federal streets, while the public market is at a third corner. The Western (State) Penitentiary is located here. The Liberty Monument in West Park is a prominent feature. In the centre of the city is a public park of 100 acres, with a monument to Humboldt; and in the northern outskirts is Riverview Park. Allegheny Park and the Washington Monument are additional points of interest. The Allegheny General, Presbyterian, and St. John General hospitals, the colored Orphan Home, Ridge Avenue Orphans' Home, the Home of the Friendless, the Gusky Orphanage, the United Presbyterian Children's Home, and the Allegheny Industrial School are among the benevolent institutions. There are three theological seminaries, connected with different branches of the Presbyterian Church. The Western University of Pennsylvania was established in 1819, and in 1905 had over 800 students, over 600 of whom were in the professional departments. The university and Allegheny Observatory occupy a high hill in the northern part of the city. In connection with the public schools there is a library of 20 000 volumes, but the Carnegie Public Library of 50,000 volumes is much more important.

The most important industrial establishments are the extensive iron and steel rolling mills, and car and locomotive works; but there are also manufactures of textile goods, flour, salt, sanitary plumbing supplies, white lead, leather, stoves, ranges, and pickles and preserves. The river traffic, which is very important, is controlled by Pittsburg. (See PITTSBURG.)

Allegheny is a city of the second class. The administration is vested in a mayor, elected every three years, and a bicameral council. The mayor, with the consent of the select council, appoints the treasurer, assessors, department of law, the directors of public works, public safety, and public charities, mayor's clerk, and police magistrates. The council elects the city clerk. The comptroller is chosen by popular vote. The annual income amounts to about $2,830,000 and expenditure $2,570,000, the latter including $130,000 for the police department, $130,000 for the fire department, $350,000 for schools, $180,000 for the operation of the water-works, and $80,000 for street lighting.

Allegheny was laid out in 1788, and was incorporated as a borough in 1828, and in 1840 as a city. On July 4, 1874, occurred a disastrous fire, in which 199 buildings were consumed or badly damaged and three weeks later a flood destroyed much property and caused 124 deaths. The city's growth since 1870 has been remarkable. Pop., 1870, 53,180; 1880, 78,682; 1890, 105,287; 1900, 129,896, including 30,200 persons of foreign birth and 3300 of negro descent; 1905 (local est.), 145,000. In February, 1906, the Governor signed a bill providing for the consolidation of Allegheny and Pittsburg (q.v.). The consolidation, however, has not yet been effected. Consult: Cushing, *History of Allegheny County* (Chicago, 1889); Lambing and White, *Allegheny County: Its Early History and Subsequent Development* (Pittsburg, 1888).

ALLEGHENY COL'LEGE. A college at Meadville, Pennsylvania, founded in 1815 as a Presbyterian institution. The first president, Rev. Timothy Alden, D.D., secured for the college the support of many prominent men, among them John Adams and Thomas Jefferson. The gifts of the libraries of James Winthrop and William Bentley also attracted attention to the institution. In 1833 the college was transferred to the patronage of the Methodist Church under an agreement that guaranteed a liberal and nonsectarian management. Courses are offered in the arts and sciences, but the main emphasis has always been put upon non-technical cultural subjects. The buildings and the grounds are valued at $350,000. The more important of the buildings are Bentley hall, the library (18,000 volumes), and Ford Memorial Chapel. The endowment amounts to $485,000. In 1906 the faculty numbered 18, and there were 275 students, of whom 89 were women. President, William H. Crawford, DD., LL.D.

ALLEGHENY RIVER. A river of Pennsylvania and New York, rising in Potter Co., Pa., nearly 2000 feet above the sea, and uniting with the Monongahela at Pittsburg to form the Ohio (Map: Pennsylvania, B 2). Although flowing through a hilly region, it is navigable for nearly 200 miles above Pittsburg, whence, via the Ohio and Mississippi, navigation extends to the Gulf of Mexico. It is 325 miles long, and drains an area of 11,000 square miles.

ALLE'GIANCE (Lat. *ad*, to + O. F. and Engl. *liege*, but the formation was influenced by Lat. *alligare*, to bind to, and also by *lex*, law). "Allegiance," says Blackstone, "is the tie, or *ligamen*, which binds the subject to the sovereign, in return for that protection which the sovereign affords the subject." Allegiance is the highest legal duty of the subject, and consequently its violation, treason (q.v.), is the highest legal offense. Allegiance is of three kinds: (1) Natural or implied allegiance is that which every native or naturalized citizen owes to the State to which he belongs and whose protection he enjoys. Independently of any express promise, every man, by availing himself of the benefits which an organized political society affords, comes under an implied obligation to defend it, and this equally whether the attack be from without or from within. This conception of allegiance as a political obligation, involved in the notion of citizenship, is comparatively modern, and has gradually supplanted the feudal conception of allegiance as a duty voluntarily assumed as an incident of the feudal tenure of land. (2) Express allegiance is that obligation which arises from an express promise or oath of allegiance. The old English oath of allegiance corresponded in the case of the sovereign, as lord paramount of all the lands in England, to the oath of fealty, which, by the feudal law, all freehold tenants were required to take to their landlords. As administered for upward of 600 years, it contained a promise "to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and terrene honor, and not to know or hear of any ill or damage intended him, without defending him therefrom."

With the substitution of the political for the feudal motive for allegiance and its consequent general obligation, the importance of the oath of allegiance has greatly diminished. It is commonly exacted of aliens acquiring naturalization, of persons lately in rebellion on resuming the status of citizens, and of public officers of all grades, and members of the bar. The form commonly employed in this country is a simple oath to support the Constitution of the United States. (See OATH.) (3) Local or temporary allegiance is that obedience and temporary aid due from an alien (q.v.) to the State or community in which he resides, by virtue of which he becomes subject to its laws, and liable for duty in the maintenance of social order.

It is but recently that the principal governments of Europe have come to recognize the right of persons voluntarily to change their allegiance as well as their residence, and such recognition is still grudging and imperfect. The United States has always held it to be a natural right, and our legislation so recognizes it. This difference of view has sometimes brought our government into sharp diplomatic conflict with the States of Europe, especially in the effort to protect from military conscription former subjects of those States who had renounced their allegiance and become naturalized citizens of the United States. These efforts have generally proved successful, but the principle contended for by our government, though accepted (so far, at least, as the naturalization of their subjects in the United States is concerned) by England, France, Germany, and Austria-Hungary, is repudiated by Russia, Turkey, and some other States. This principle is plainly declared in the act of Congress relating to naturalization (q.v.), passed in July, 1868. The preamble states that the right of expatriation is natural and inherent in all people, and indispensable to the enjoyment of the rights to life, liberty, and the pursuit of happiness; that, recognizing this right, our government has received emigrants from all nations and given them citizenship and protection; that it is necessary for the maintenance of public peace that the claim of foreign allegiance as to such adopted citizens should be promptly and finally disavowed; and therefore it was enacted that any declaration, opinion, order, or decision of any officer of this government which denies, impairs, restricts, or questions the right of expatriation, is inconsistent with the fundamental principles of the government; that all naturalized citizens of the United States, while in foreign States, are entitled to, and shall receive from this government, the same protection of person and property that is accorded to native-born citizens in like circumstances. This broad declaration of rights and duties was followed in May, 1870, by the British Parliament in an act revising all British laws on alienage, expatriation, and naturalization — the government for the first time recognizing the right of subjects to renounce allegiance to the crown.

Allegiance of the population of a State or district is often transferred *en masse*, as an incident of territorial conquest or as the result of the cession of territory, as in the successive purchases of Louisiana from France, of Florida and the Philippine Islands from Spain, and of Alaska from Russia, as well as in the enforced cession to the United States of Texas and Porto Rico, and to Germany of Alsace-Lorraine as the result of successful war. The right of a State to claim the allegiance of the inhabitants of territory so acquired is undoubted, and it is only as a humane concession to the sentiment of loyalty of such a population that the right to choose between the old and the new allegiance is sometimes reserved by the treaty of cession. This permission has, in modern times, usually been granted, the inhabitants of the ceded territory being permitted to retain their nationality by withdrawing within a specified period from the ceded district.

In military usage, allegiance is the oath demanded of officers and men to the sovereign or president, as supreme commander-in-chief of the army. In the German Empire, the troops of Bavaria do not recognize the absolute control of the King of Prussia, except in time of war, when the full oath of allegiance and implicit obedience to the orders of the German Emperor is taken. Consult: Blackstone, *Commentaries on the Laws of England*, Book I., ch. x.; Pollock and Maitland, *History of English Law* (second edition, Boston, 1899), Volume I., pages 296-307, 458-467, Volume II., pages 502-511; Salmond, "Citizenship and Allegiance," in *Law Quarterly Review*, Volume XVIII., numbers 67, 69 (London, July, 1901, and January, 1902); Kent, *Commentaries on American Law*, Volume II., section xxv. See also CITIZEN; SUBJECT.

AL'LEGORY (Gk. ἀλληγορία, *allēgoria*, speaking otherwise, allegory, from ἄλλος, *allos*, other + ἀγορεύειν, *agoreuein*, to speak). The allegory as a literary manner is a narrative in which the incidents and the characters really refer to a complete and logical scheme of underlying thought. To be successful, the narrative must be not only interesting for itself, but also in perfect harmony with the veiled course of abstract reasoning. Such is Bunyan's *Pilgrim's Progress*, where, under the guise of a journey from the City of Destruction to the Celestial City, are portrayed the spiritual conflicts and the ultimate victory of the faithful Christian. Allegory, like other kindred figurative ways of speech, such as metaphor and personification, appears in all literatures. The Eastern people from the earliest times have been fond of it. Witness the beast fables which pass under the name of Pilpay, where moral observations are enforced by tales about animals; also the comparison of Israel to a vine in the eightieth Psalm. Though the Greeks had the allegorical habit earlier, the first definite mention of an allegory among them occurs in Plato's *Phædrus*. In this dialogue, Socrates remarks on the tendency toward the rationalistic explanation of myths. This and other dialogues of Plato contain very beautiful allegories, among which may be cited the comparison of the soul to a charioteer drawn by two horses, one white and the other black. For Latin literature may be mentioned the story of Cupid and Psyche, which, though Greek in origin, survives only in the *Golden Ass* of Apuleius, Vergil's well-known description of Fame in the fourth book of the *Æneid*, and Ovid's splendid picture of the abode of that goddess in the twelfth book of the *Metamorphoses*. To a later time belongs Boëthius's *De Consolatione Philosophiæ* (sixth century A.D.), which was one of the widest read books in the Middle Ages. The most flourishing period for the allegory in Western Europe was from 1300 to 1600. In the long list of works are Dante's *Divine Comedy, The Romance of the Rose*. Langland's *Piers Plowman*, Chaucer's *House of Fame*, the writings of a whole school of Scotch poets, Hawes's *Pastime of Pleasure*, Barclay's *Ship of Fools*, and Spenser's *Faerie Queene*. Set allegory has now gone out of fashion, but we have in its place a vaguer symbolism, as in Tennyson's *Idylls of the King*.

The form of allegory thus defined and illustrated is often called moral or spiritual, to distinguish it from the historical allegory; i.e., the representation of historical characters under fictitious names. Thus Lucifera in the *Faerie Queene* stands not only for pride, but also for Mary, Queen of Scots. The historical allegory became in the seventeenth century a favorite device of romancers, who described contemporary events in the terms of recent history. Of this style, an admirable example is Madame de Lafayette's *Princesse de Clèves*. Moreover, allegory is not confined to literature; it appears equally in painting, and sometimes in sculpture.

Allegorical Interpretation. That kind of interpretation whereby the literal meaning of a passage or work is set aside for a more spiritual and profound import. St. Paul allegorizes when he interprets the history of the free-born Isaac and the slave-born Ishmael (Galatians iv : 24). At Alexandria, where met the Greek and the Jew, allegorical intrepretation of the Old Testament was practiced as a critical method. Philo Judæus (B.C., 20), for example, applied the principles of Plato's philosophy to Hebrew theology. He was followed by many Christian theologians, the most famous of whom were Clement of Alexandria and Origen. The latter went so far as to say that "the Scriptures are of little use to those who understand them as they are written." As a specimen of his procedure may be taken his interpretation of the Mosaic account of the Garden of Eden. According to him, Paradise symbolized a high primeval spirituality; the Fall consisted in the loss of this state through spiritual and not material temptation; and the expulsion from the Garden lay in the soul's being driven out of its region of original purity. This allegorical method also gained foothold among the critics of Greek literature. Porphyry (d. c. 305), for example, explained the grotto of the nymphs in Homer's *Odyssey* (Book XIII.) as an allegory of the world. For a succinct account of the progress of allegory with special reference to English literature, consult W. J. Courthope, *A History of English Poetry* (London, 1895).

ALLEGRI, ȧl-lā′grê, Antonio. See Correggio.

ALLEGRI, Gregorio (1584-1652). An Italian composer. He was born in Rome, probably of the Correggio family. He studied under Nanini, and was a friend of Palestrina. Appointed to the choir of the Sistine Chapel, Rome, by Urban VIII., he retained the position until his death. He was one of the earliest composers for stringed instruments. His most celebrated work, however, is the *Miserere*, for two choirs (of four and five parts), still annually rendered in the Sistine Chapel on Good Friday. Mozart, at the age of fourteen, performed the wonderful feat of writing the entire work from memory after having heard it but twice. Allegri is regarded as a link between the Roman and Neapolitan periods of Italian music.

ALLEGRO, ȧl-lā′grô (It., from Lat. *alacer*, alacritous, lively). One of the five principal tempos (q.v.) in music, implying that the piece is to be performed in a quick or lively style. Allegro, like all the other degrees of movement, is often modified by other terms, such as *Allegro non tanto, Allegro ma non troppo, Allegro moderato, maestoso, giusto, commodo, vivace, assai, di molto, con brio*, etc. As a substantive, Allegro is used as the name of a whole piece of music, or a movement of a symphony, sonata, or quartet. *Allegretto*, a diminutive of Allegro, somewhat slower than the latter and faster than *Andante*.

ALLEINE, ăl′len, Joseph (1634-68). An English nonconformist divine, author of *An Alarm to the Unconverted*. He was born at Devizes, 86 miles west of London, was educated in Corpus Christi College, Oxford, and became a tutor there (1653). He was offered a political place, which he declined, but gladly took the office of assistant to George Newton, rector of the church of St. Mary Magdalene, Taunton (1654). About this time he married Theodosia, daughter of Richard Alleine. He was not only constant in religious work, but deeply learned in various sciences, and on intimate terms with the patriarchs of the Royal Society. When the persecution of nonconformists came, he and his senior pastor were ejected, and Alleine became an itinerant preacher of the Gospel wherever he could find opportunity. For this he was imprisoned, but released in May, 1664; yet in spite of the Conventicle Act or Five-mile Act, he pursued his work, and was again imprisoned. His later years were full of persecution and suffering. No Puritan nonconformist name is more affectionately cherished than his. He died at Taunton, November 17, 1668. For his life, consult Stanford (London, 1861).

AL′LEINE, or **ALLEIN,** Richard (1611-81). An English writer and theologian, author of *Vindiciæ Pietatis*, or *A Vindication of Godliness* (London, 1663). He was born at Ditcheat, Somersetshire, educated at Oxford; became assistant in the ministry to his father, Richard Alleine, and was noted for his eloquence. He declared for the Puritans, but continued for twenty years (1641-62) rector of Batcombe in Somerset. On the passage of the act of uniformity he went with the ejected, and, after the five-mile act, preached where he could find occasion. His *Vindication of Godliness* was refused license, and Roger Norton, the King's printer, caused a large part of the first edition to be seized and sent to the royal kitchen for kindling; but, on reading it, he brought back the sheets and sold the work from his own shop, for which he had to beg pardon on his knees at the council table. Alleine died at Frome Selwood, December 22, 1681.

ALLEMAINE, ăl-mān′. An old name for Germany (cf. Fr. *Allemagne*). See Alemanni.

ALLEMANDE, ăl′lĕ-mȧnd′ (Fr., feminine of *allemand*, German). A French dance, said to have been invented in the time of Louis XIV., which again became popular at the Parisian theatres during the reign of Napoleon I. It has a slow waltz kind of tempo, and consists of three steps (*pas marchés*) made in a sliding manner, backward and forward, but seldom waltzing or turning round. The whole charm of the dance lies in the graceful manner of entwining and detaching the arms in the different steps. In England it was called Almain, and is mentioned in Ben Jonson's play, *The Devil is an Ass*, acted in 1610, which proves it of earlier origin. The name has also reference to a German dance of Swabia, of which Beethoven's twelve *Deutsche Tänze* for orchestra are specimens. The Allemande is also the name of a movement in the *Suite* (q.v.), having no relation to the dance of the same name. It usually consists of a figurative melody which has a simple accompaniment.

AL′LEMAN′NI. See Alemanni.

AL′LEN. Alexander Viets Griswold, D.D. (1841—). A Protestant Episcopal theologian, born at Otis, Mass. He graduated at Kenyon College in 1862, and at Andover Theological Seminary in 1865. In 1867 he became professor of church history in the Episcopal Theological School at Cambridge, Mass. His publications include *Continuity of Christian Thought* (Boston, 1884, eleventh edition, 1895), *Life of Jonathan Edwards* (1889), *Religious Progress* (1894), *Christian Institutions* (New York, (1897), *Life and Letters of Phillips Brooks* (1901, two volumes).

ALLEN, Arabella. A character in Dickens's *Pickwick Papers*. She becomes Mrs. Nathaniel Winkle.

ALLEN, Charles Grant Blairfindie (1848-99). An English author, better known as Grant Allen. He was born in Kingston, Canada, of Irish descent, and was educated at Merton College, Oxford, where he graduated in 1871. He then spent a few years as principal of a colonial college in Jamaica. He is best known by his popular scientific works, his expositions of the theory of evolution being particularly clear and readable. He spent most of his life in London, where he died. Among his scientific books the following may be mentioned: *Physiological Æsthetics* (1877), probably his best work; *The Color Sense* (1879), *The Evolutionist at Large* (1881), *Vignettes from Nature* (1881), *Colin Clout's Calendar* (1883), *Flowers and their Pedigrees* (1884), *The Story of the Plants* (1895), and *Evolution of the Idea of God* (1897). He also wrote a life of Charles Darwin (1885), and a number of novels, among them: *Philistia* (1884), *The Devil's Die* (1888), *The Woman Who Did* (1895), *A Bride from the Desert* (1896). Historical studies also attracted him, and he published *Anglo-Saxon Britain* (1881), and a series of historical guide books to Paris, Florence, and Belgium.

ALLEN, Charles Herbert (1848—). An American politician. He was born at Lowell, Mass., graduated in 1869 at Amherst College, and for a time was in the lumber industry at Lowell. In 1881-82 he served in the Lower House of the Massachusetts State Legislature, and in 1883 in the State Senate. He was subsequently elected to the Forty-ninth and Fiftieth (1885-89) Congresses. In 1898 he succeeded Theodore Roosevelt as Assistant Secretary of the Navy, and in 1900-2 was the first civil governor of Puerto Rico. In 1902 he retired from public life and became associated with banking and insurance interests in New York City.

ALLEN, David Oliver (1800-63). An American missionary, born at Barre, Mass. He graduated in 1823 at Amherst College, studied at Andover Theological Seminary, and in 1827 went to Bombay as a missionary. He traveled widely in western India, established schools, directed a new translation of the Bible into Mahratta, and in 1853 returned, much broken in health, to America. His *History of India* was published at Boston in 1856.

ALLEN, Ebenezer (1743-1806). An American soldier. He was born in Northampton, Mass., and removed to Vermont in 1771. He became a lieutenant in a company of Green Mountain Boys, and during the Revolution served first as captain in and then as major of a battalion of New Hampshire rangers. He was conspicuous for gallantry at the battle of Bennington, and in September, 1777, forced the evacuation of Ticonderoga by his capture of Mount Defiance.

ALLEN, Edward Patrick (1853—). A Roman Catholic bishop of Mobile, Ala., appointed in 1897. He was born at Lowell, Mass., and after completing a theological course at Mount St. Mary's College, Emmitsburg, Md., was ordained a priest in 1881. Afterward he held a professorship at Mount St. Mary's, and was its president from 1884 until he was consecrated bishop by Cardinal Gibbons. During his administration he relieved the college of its heavy indebtedness, increased its equipment, and enlarged its faculty.

ALLEN, Elisha Hunt (1804-83). An American politician and Hawaiian justice, born at New Salem, Mass. He graduated at Williams College, was called to the Massachusetts bar, and was a member of the State Legislature of Maine from 1836 to 1841, and in 1846. In 1849 he was elected to the Massachusetts Legislature, and from 1852 to 1856 was United States consul at Honolulu, Hawaii. In 1857-76 he was Chancellor and Chief Justice of the Hawaiian Islands, and from that time was Minister of the Hawaiian Islands to the United States.

ALLEN, Elizabeth Akers (1832—). An American author, born at Strong, Me. Her verses, entitled "Rock Me to Sleep, Mother," became widely known, and were frequently set to music. Mrs. Allen began to write under the pen-name Florence Percy. Among her works, which include both prose and poetry, are *Poems* (1866-8-9); *Queen Catharine's Rose* (1885); *The Silver Bridge* (1885); *Two Saints* (1888); *The Proud Lady of Stavoren* (1897); *The Ballad of the Bronx* (1901), and *The Sunset Song* (1903).

ALLEN, Ethan (1737-89). An American soldier. He was born at Litchfield, Conn., and about 1769 removed to Vermont, settling first at Bennington, where he became conspicuous in the contest between New Hampshire and New York for jurisdiction over the "New Hampshire Grants," now Vermont. He represented his fellow settlers in a suit at Albany in 1771, but their claims being disregarded, he organized a force of Green Mountain Boys for the eviction of New York settlers. Governor Tryon, of New York, thereupon declared him an outlaw, and offered £150 for his arrest. At the outbreak of the Revolution, Allen and his associates offered their services to the patriot party, and organized an expedition against Ticonderoga (q.v.). On the morning of May 10, 1775, he surprised the garrison and forced its commander to surrender "in the name of the great Jehovah and the Continental Congress." Allen soon afterward joined General Schuyler's army, was employed in secret missions to Canada, and rendered valuable aid in Montgomery's expedition. He was taken prisoner, September 25, 1775, near Montreal, and was sent to England. Some months later he was sent back to this country and was kept as a prisoner in Halifax and New York until May 3, 1778, when he was exchanged. After his release, he returned to Vermont, was put in command of the militia, and soon afterward became a lieutenant-colonel in the Continental army; though he devoted his attention chiefly to the old territorial dispute, and, incidentally, carried on a correspondence with the enemy, upon which a charge of treason was subsequently based. No satisfactory explanation has ever been given of his conduct, but the charge of treason is at least not fully substantiated. He moved to Burlington in 1787, and died there two years later. Though a blusterer, he was as full of action as he was of talk, and had very great ability as a leader both in politics and in war. He wrote a *Narrative of Colonel Ethan Allen's Captivity* (1779), which went into numerous editions; a *Vindication of the Opposition of Vermont to the Government of New York* (1779), and *Reason the Only Oracle of Man, or A Compendious System of Natural Religion.* Consult Henry Hall, *Ethan Allen* (New York, 1892).

ALLEN, Frederic de Forest (1844-97). An American classical scholar. He was born at Oberlin, Ohio, and graduated at Oberlin College in 1863. He was at Leipzig in 1868-70, and took his Ph.D. with his thesis *De Dialecto Locrensium*, which is still an important monograph. In 1885-86 he was director of the American School of Classical Studies at Athens. In addition to numerous articles in classical journals he published an edition of the *Medea of Euripides* (1876); *Remnants of Early Latin* (1880); a revision of Hadley's *Greek Grammar* (1884), and *Greek Versification in Inscriptions* (1888).

ALLEN, Fred Hovey (1845—). An American Congregational clergyman and author. Born at Lyme, N. H. He graduated at the Hartford Theological Seminary, studied at Boston University and the Universities of Berlin, Vienna, and Paris, and held pastorates in Boston, Wollaston, Abington, and Rockland. He founded and for some time edited the Lawrence (Mass.) *Eagle*, but is best known as the inventor of the first photogravure plates for art reproduction made in America. His writings include *Masterpieces of Modern German Art* (1884), *Recent German Art* (1885), and *Grand Modern Paintings* (1888).

ALLEN, Grant. See Allen, Charles Grant Blairfindie.

ALLEN, Harrison (1841-97). An American physician and anatomist. He was born in Philadelphia, and graduated in medicine at the University of Pennsylvania in 1861. In 1862 he became a surgeon in the United States army, and served until the conclusion of the Civil War. In 1865 he was made professor of comparative anatomy and medical zoölogy at the University of Pennsylvania, and was transferred in 1878 to the chair of physiology, which he occupied until 1895. Dr. Allen was professor of anatomy and surgery at the Philadelphia Dental College, and surgeon to the Philadelphia Hospital. He was president of the American Laryngological Society in 1886 and of the American Anatomical Society from 1891 to 1893. In addition to many papers contributed to medical journals, he was the author of *Outlines of Comparative Anatomy and Medical Zoölogy* (1867), *Studies in the Facial Region* (1874), *An Analysis of the Life Form in Art* (1875), and *System of Human Anatomy* (1880).

ALLEN, Henry (1748-84). An American religious enthusiast. He was born at Newport, R. I., but afterward settled in Nova Scotia, where he taught that the souls of all men are emanations from the same Spirit; that they were present with our first parents in Eden; that Adam and Eve in innocency were pure spirits without material bodies; that there will be no resurrection of the body; that men are not bound to obey the ordinances of the Gospel, and that the Scriptures are not to be interpreted literally, but in a spiritual sense. He published a volume of hymns and several treatises and sermons. Though he made many converts to his religious ideas, the Allenites dwindled after his death.

ALLEN, Henry Watkins (1820-66). An American soldier and politician. He was born in Prince Edward Co., Va.; taught school and practiced law. In 1842 he raised a company, and served in the Texan war against Mexico. He removed to Louisiana in 1850, and was subsequently a member of the State Legislature. After studying law at Harvard and traveling in Europe, he entered the Confederate service in 1861 as lieutenant-colonel. He was wounded at Baton Rouge and at Shiloh, became a brigadier-general in 1864, and in the same year was elected Governor of Louisiana, in which capacity he rendered valuable services to the Confederate government. After the war he removed to the City of Mexico, and edited the *Mexican Times.*

He wrote a readable book entitled *Travels of a Sugar Planter.*

ALLEN, Horace Newton (1858—). United States minister in Korea. He was born in Delaware, O., graduated in the Ohio Wesleyan University, studied medicine, and went as medical missionary (Presbyterian) to China. In 1884, at the time of the *coup d'état* of Kim Ok Kiun, he was at Seoul, Korea, and saved the life of a relative of Queen Ming. He was made court physician, and established a hospital under government control. When the first Korean legation went to Washington in 1888, he acted as interpreter and secretary. Returning to Korea in 1890, he soon became noted for his knowledge of Korean affairs, and in 1901 was made United States minister plenipotentiary to the Korean Empire. Publications: *Korean Tales* (1889); *A Chronological Index of the Foreign Relations of Korea from the Beginning of the Christian Era to the 20th Century* (1900); *Supplement,* (1903); *Fact and Fancy* (1904).

ALLEN, Horatio, LL.D. (1802-89). An American civil engineer. He was born at Schenectady, N. Y., graduated in 1823 at Columbia, and in 1826 was appointed resident engineer of the summit level of the Delaware and Hudson Canal. He was sent to England in 1828 to buy locomotives for the canal company's projected railway, and in 1829, at Honesdale, Pa., the initial point of the railway, operated the "Stourbridge Lion" in the first trip made by a locomotive on this continent. From 1829 to 1834 he was the chief engineer of the South Carolina Railway, at that time the longest railway in the world, and from 1838 to 1842 was principal assistant engineer of the Croton aqueduct for supplying water to New York City. He was at various times chief engineer and president of the Erie Railway, and consulting engineer for the Panama Railway and the Brooklyn Bridge. In 1872 and 1873 he was president of the American Society of Civil Engineers. He was the inventor of the so-called "swiveling truck" for railway cars.

ALLEN, Ira (1751-1814). One of the founders of Vermont. He was born in Cornwall, Conn., and in 1772 removed to Vermont, where he served as a lieutenant under his brother, Ethan, and took an active part in the boundary dispute between New York and New Hampshire. He was a member of the Vermont Legislature (1776-77), and of the State Constitutional Convention (1778), and in 1780-81 was a commissioner to Congress. He went to France in 1795 and bought 20,000 muskets and 24 cannon, intending to sell them to Vermont; but he was captured at sea, and taken to England on a charge of furnishing arms to Irish rebels. He was acquitted after a lawsuit that lasted eight years. He published *The Natural and Political History of Vermont* (London, 1798), and *Statements Appended to the Olive Branch* (1807).

ALLEN, James Lane (1849—). An American novelist, born in Lexington, Ky. He graduated at Transylvania University and taught first in Kentucky University, and afterward at Bethany College, West Virginia, but after 1886 devoted himself entirely to literature, publishing successively *Flute and Violin* (1891), *The Blue Grass Region, and Other Sketches* (1892), *John Gray: a Novel* (1893), *The Kentucky Cardinal* (1894), *Aftermath* (1895), *A Summer in Arcady* (1896), *The Choir Invisible* (a rewriting of *John Gray,* 1897), *The Reign of Law* (1900), and *The Mettle of the Pasture* (1903). His stories deal mainly with life and nature in Kentucky, and are elaborate in stylistic art. His short stories, such as *The White Cowl* and *Sister Dolorosa,* were the first, and are among the best fruits of his genius. His later works, however, show more conscious artistic elaboration.

ALLEN, Jerome (1830-94). An American educator. He was born at Westminster West, Vt., and graduated at Amherst College in 1851. He was at the head of several educational institutions in the West from 1851 to 1885, and professor of pedagogy at the University of New York from 1887 to 1893. To his efforts more than to any other agency was due the founding of the New York School of Pedagogy, of which he became dean in 1889. Professor Allen's publications include a *Handbook of Experimental Chemistry, Methods for Teachers in Grammar, Mind Studies for Young Teachers,* and *Temperament in Education.*

ALLEN, Joel Asaph (1838—). An American naturalist. He was born at Springfield, Mass., July 19, 1838. Between 1865 and 1869, and again in 1873, he took part in various scientific expeditions to Brazil and Florida, and to the Rocky Mountains, gathering material and contributing studies of it to scientific periodicals, especially the *Proceedings of the Boston Society of Natural History.* In 1870 he became an assistant in the Museum of Comparative Zoölogy at Harvard University, and later its curator of birds and mammals. In 1886 he was appointed to a similar office in the American Museum of Natural History in New York. He was one of the founders and early presidents of the American Ornithologists' Union and the editor of its quarterly publication, *The Auk,* and one of the early members of the National Academy. Dr. Allen has won rank as one of the foremost systemists of American mammals and birds, in which work he has made minute subdivisions; and has made fruitful researches into the principles of geographical distribution, and those governing climatic and seasonal variation in color, size, and other details. In addition to a great number of scientific papers, he is author of *The American Bisons* (Cambridge, 1876); *Monographs of North American Rodentia* (with E. Coues) (Washington, 1877); and *History of North American Pinnipedia* (Washington, 1880).

ALLEN, Joseph Henry (1820-98). A Unitarian scholar. He was born at Northborough, Mass., August 21, 1820; graduated at Harvard College, 1840, and at the Divinity School in 1843. He was pastor at different places; editor of *The Christian Examiner,* 1857-69; lecturer upon ecclesiastical history in Harvard University, 1878-82; joint editor (with J. B. Greenough) of a series of classical text-books; author of *Hebrew Men and Times* [to the Christian era] (Boston, 1861); *Christian History in its Three Great Periods.* (1) Early Christianity, (2) The Middle Age, (3) Modern Phases (1882-83, 3 volumes); *Our Liberal Movement in Theology, Chiefly as Shown in Recollections of the History of Unitarianism in New England* (1882), *Historical Sketch of the Unitarian Movement since the Reformation* (New York, 1894). His works show independent study and acquaintance with the sources, and his denominational histories rest upon personal acquaintance with the leaders. He died in Cambridge, Mass., March 29, 1898.

ALLEN, Karl Ferdinand (1811-71). A Danish historian, born at Copenhagen. He studied at the university there, and in 1845 to 1848 made examinations of various European archives. He was appointed an instructor and titular professor at Copenhagen in 1851, and professor of history and northern archæology in 1862. His principal work is his *De Tre Nordiske Rigers Historie, 1497-1536* (The History of the Three Northern Kingdoms, 1497-1536, 5 volumes, 1864-72), one of the most important contributions to the history of northern Europe.

ALLEN, Ralph (1694-1764). An English philanthropist. He was known for his numerous benefactions, and as a friend of Fielding (who represents him as Squire Allworthy in *Tom Jones*), of Pitt, and of Pope, who in the epilogue to the *Satires of Horace*, says of him:

> "Let humble Allen, with an awkward shame,
> Do good by stealth, and blush to find it fame."

ALLEN, Richard (1760-1831). A colored Methodist preacher. He was born in slavery, but bought his freedom, and afterward acquired considerable wealth. He became a local Methodist preacher in 1782, and organized the first church for colored people in the United States, in Philadelphia, in 1793. He was the first colored minister ordained by Bishop Asbury, a deacon (1799), and was elected a bishop of the African Methodist Episcopal Church on its formation in 1816. He died in Philadelphia.

ALLEN, Robert (1815-86). An American soldier. He was born in Ohio, graduated at West Point in 1836, served with distinction in the second Seminole War and in the Mexican War, and was subsequently chief quartermaster of the Pacific division until 1861, when he became quartermaster of the Department of Missouri. In this capacity, and afterward (1863-66), as chief quartermaster of the Missouri Valley, he rendered valuable services to the Federal armies in the West, and by successive promotions became brevet major-general in 1865. After the war he was again chief quartermaster of the Pacific division, until retired in 1878.

ALLEN, Thomas (1849—). An American landscape and animal painter. He was born at St. Louis, Mo., studied at the Düsseldorf Academy, and has his studio in Boston. He became a member of the Society of American Artists (1880), and an associate member of the National Academy of Design (1884), and was one of the international board of judges at Chicago in 1893. His most successful works are chiefly landscape and animal subjects, and include "O'er All the Hilltops is Rest," "Maplehurst at Noon," and "Toilers of the Plain."

ALLEN, Viola (1867—). An American actress who in 1898 made a wide reputation as Glory Quayle in Hall Caine's dramatized novel, *The Christian*, in which she starred with great popular success. She is the daughter of an actor, C. Leslie Allen, and appeared on the stage when fifteen years old, in *Esmeralda*, at the Madison Square Theatre, New York (1882). Later she played in the company of John McCullough and with Tommaso Salvini, Lawrence Barrett, Joseph Jefferson, and W. J. Florence. In 1893, she was at the Empire Theatre, New York, where she remained four years. Among the pieces in which she there appeared were *The Masqueraders* and *Under the Red Robe.* After her seasons in *The Christian*, she starred with *In the Palace of the King* (1900), by F. Marion Crawford and Lorimer Stoddard. Consult: L. C. Strang, *Famous Actresses of the Day in America* (Boston, 1899); J. B. Clapp and E. F. Edgett, *Players of the Present* (New York, 1899).

ALLEN, William (1532-94). An English cardinal. Born at Rossall, he studied in Oriel College, Oxford, and became principal of St. Mary's Hall in 1556. He opposed the Reformation, and after Elizabeth's accession he went to Louvain (1561). He returned to England (1562), but his proselytizing zeal made another flight necessary, and he went to Holland (1565), and never revisited England. He was ordained priest at Mechlin, was more prominent in organizing in the University of Douai (1568) a college for English Roman Catholics, whence he sent Jesuit priests to his native land, the aim of his life being to restore Papal supremacy in England. In 1570 he became regius professor of divinity, in 1587 a cardinal, in 1589 he was offered the archbishopric of Malines, but declined the honor. He died at Rome, October 16, 1594. Consult his *Letters and Memorials*, with introduction by T. F. Knox (London, 1882). He made vigorous efforts to check the progress of the Protestant Reformation in England and engaged in polemical writing. Several violent libels of the time are attributed to his pen, but his authorship of these has been disputed. Among the Jesuit priests he sent to England was the celebrated Father Campion, put to death by Elizabeth. He published ten volumes, among them *Certain Brief Reasons Concerning Catholic Faith* (1564), and aided in revising the English translation of the Bible known as the Douai Bible.

ALLEN, William (1770-1843). An English philanthropist. He was lecturer on chemistry in Guy's Hospital, fellow of the Royal Society, and one of the founders of the Pharmaceutical Society. Jointly with Samuel Pepys, he established the chemical composition of carbonic acid. He belonged to Sir Humphry Davy's circle of friends, and at his request he lectured on physics at the Royal Institution. He was a prominent member of the Society of Friends, and bore an active part in the philanthropic movements of his time. Wilberforce and Clarkson were his intimate friends, and he shared in the anti-slavery agitation. He was an active supporter of Lancaster and Bell in their educational movement, championing their side of the controversy in his journal, *The Philanthropist:* and he was associated with Robert Owen in his schemes for social improvement. He also founded industrial schools, and advocated the abolition of capital punishment. He contributed papers to the *Philosophical Transactions.* Consult *Life of William Allen, with Selections from His Correspondence* (2 volumes, 1847).

ALLEN, William (1784-1868). An American educator and author. He was born at Pittsfield, Mass.; graduated at Harvard in 1802, and after a few years spent in pastoral work became assistant librarian at Harvard. There he prepared his *American Biographical and Historical Dictionary* (1809), the first work of general biography published in the United States. The third edition (1857) has notices of nearly 7000 Americans, while the first has only 700. In 1810, he became his father's successor in the pulpit in Pittsfield. In 1817 he was elected president of Dartmouth College, and from 1820 to 1830 he was president of Bowdoin College. Allen's memoir was published in 1847.

ALLEN, William (1806-79). An American statesman. He was born in North Carolina, but at an early age went to Ohio, where he practiced law. He was elected to Congress in 1832 by the Democrats, but was defeated on a second trial. He was twice elected to the United States Senate, and served from 1837 to 1849. In 1848 he was offered the nomination for President, but declined it on the ground that he was pledged to General Lewis Cass. In 1873 he was elected Governor of Ohio. Two years afterward he was a candidate for reëlection, but as he made his canvas on the greenback issue, of which cause he had become the foremost advocate, he was defeated by R. B. Hayes. He is said to be the author of the famous alliterative slogan of the campaign of 1844, "Fifty-four forty, or fight."

ALLEN, William Francis (1830-89). An American educator and historian, joint editor of Allen and Greenough's series of school books. He was born at Northborough, Mass., and graduated at Harvard in 1851. He studied history and antiquities in Germany and Italy for two years, and afterward became professor of Latin and Roman history at the University of Wisconsin, a position which he filled from 1867 until his death. In addition to his text books, he published many works of standard merit, including *Outline Studies in the History of Ireland* (1887).

ALLEN, William Henry (1784-1813). An American naval officer. He was born in Providence, R. I., and entered the navy in 1800. He was a lieutenant on the frigate *United States* in the action with the *Macedonian*, October 25, 1812, in which the latter was captured. Afterward he commanded the brig *Argus*, cruising off England in 1813. After having captured $2,000,000 worth of property, he encountered the British brig *Pelican*, August 14, and lost his own vessel, and died the next day of wounds received in the fight.

ALLEN, William Henry, LL.D. (1808-82). An American educator. He was born at Manchester, Me., and graduated at Bowdoin College in 1833. He was profesor of Latin and Greek at Cazenovia (N. Y.) Seminary from 1833 to 1836; of natural philosophy and chemistry in Dickinson College, 1836-46; of philosophy and English literature there from 1846 to 1849; president of Girard College, Philadelphia, 1849-62 and 1867-82. In 1872 he was chosen president of the American Bible Society.

ALLEN, Zachariah (1795-1882). An American scientist and inventor. He was born in Providence, R. I., graduated at Brown University in 1813, studied law in the office of James Burrill, and was admitted to the bar in 1815. Subsequently he became a manufacturer, and in 1825 visited Europe for the study of mechanical methods in England, Holland, and France. He constructed (1821) the first hot-air furnace for the heating of dwelling-houses, was the first to calculate the motive power of Niagara Falls (*Silliman's Journal*, April, 1844), devised the system of mutual insurance of mill property, and framed new laws for regulating the sale of explosive oils. In 1833 he patented his best-known invention, the automatic cut-off valve for steam engines, still in use with improvements. He was from 1822 a member, and from 1880 president, of the Rhode Island Historical Society. His publications include *The Science of Mechanics* (1829), *Philosophy of the Mechanics of Nature* (1851), *The Rhode Island System of Treatment of the Indians, and of Establishing Civil and Religious Liberty* (1876; address at the bi-centennial anniversary of the burning of Providence), and *Solar Light and Heat, the Source and Supply* (1879). Consult Perry, *Memorial of Zachariah Allen, 1795-1882* (Cambridge, 1883).

ALLENDE, ȧ-yân'dâ, or **SAN MIGUEL DE ALLENDE**. An historic city in the eastern part of the state of Guanajuato, Mexico, situated on the Lara River, 40 miles north of Celaya (Map: Mexico, H 3). It figured prominently in the first period of the revolution against Spain, taking its modern name from one of the great patriot leaders, Ignacio de Allende. The principal industries are blanket-making and the manufacture of horse equipments. Pop., 1900, 10,547.

AL'LENITES. See Allen, Henry.

ALLENSTEIN, äl'lĕn-stīn. A town of East Prussia, capital of the circle of Allenstein, situated about 32 miles from the Russian frontier, on the river Alle (Map: Prussia, J 2). It is a well-built and neat-looking town, with several churches, a gymnasium, and an agricultural school, a hospital, gas works, and a number of markets; of industrial establishments it has saw mills, machine shops, breweries, and a match factory. Pop., 1900, 24,307; 1905, 27,422.

AL'LENTOWN. A city and the county seat of Lehigh County, Pa., 50 miles (direct) north by west of Philadelphia, on the Lehigh River, and on the Lehigh Valley, Central of New Jersey, and Philadelphia and Reading railroads (Map: Pennsylvania, F 3). The city is one of the largest producers of furniture in the United States, is second to Paterson in the production of American silks, and has extensive manufactures of iron and steel, cement, cigars, and thread. The city owns and operates its water-works. It is the seat of Muhlenberg College (Lutheran), established 1867, and of the Allentown College for Women, and has a fine hospital. Allentown was laid out about 1752 by William Allen, then Chief Justice of Pennsylvania, and was known by its present name until, in 1811, it became the seat of justice of Lehigh County, and was incorporated as the borough of Northampton. In 1838 its first name was restored, and in 1867 Allentown was incorporated by special charter. Under the charter of 1889, now in operation, the mayor is elected for three years, and the city council is composed of two bodies, an upper house of 11 members and a lower house of 22. The annual income of the city amounts to about $450,000; expenditures to $360,000, of which $105,000 is spent in construction and other capital outlay, and $255,000 in maintenance and operation. The principal items of expense are $10,000 for the police, $15,000 for the fire department, and $95,000 for schools. Pop., 1890, 25,228; 1900, 35,416; 1903 (est.), 38,573. See Matthews and Hungerford, *History of the Counties of Lehigh and Carbon* (Philadelphia, 1884).

ALLEP'PI, or **ALLAPPALI**. A seaport on the western coast of the native State of Travancore, in the southern part of Madras, British India (Map: India, C 7). It has a sheltered roadstead, and carries on a considerable trade in coffee, pepper, and cardamoms. By means of canals and lagoons along the coast, Alleppi communicates with Cochin on the north and Trivandrum on the south. Population, in 1901, 24,918.

ALLER, äl′ẽr. A river of Germany, rising about 20 miles west of Magdeburg. It flows northwestward, joining the Weser near Verden. Of its course of 155 miles, the greater part across Hanover, the portion which lies below Calle is navigable.

AL′LERTON, Isaac (c. 1583-1659). One of the Pilgrim Fathers who came to America in the first voyage of the *Mayflower*. He was one of the energetic and wealthy members of Plymouth colony, and was sent to Europe several times as its agent. A disagreement with the colony in 1631 resulted in his removal to New Amsterdam, where he became a member of the council in 1643. He spent the latter years of his life in New Haven. His daughter, Mary, was the last survivor of the *Mayflower* company.

ALLEVARD-LES-BAINS, àl′l′-vär′lâ-băN′. A town of the department of Isère, France, on the left bank of the Breda, 15 miles southeast of Chambéry. It has iron and steel manufactures, and is greatly resorted to for its valuable medicinal springs and the picturesque scenery of its valley. Pop., 1901, 2546.

ALLEYN, ăl′len, Edward (1566-1626). An English actor, theatre manager, and the founder of Dulwich College. Born in the parish of St. Botolph, just out of London, he went upon the stage shortly before Shakespeare came from Stratford. Alleyn won rapid success, especially in tragedy, playing among other rôles the Jew in Marlowe's *Jew of Malta*, and also Tamburlaine and Faustus. He owned several playhouses, and in 1592 married the step-daughter of Philip Henslowe (q.v.), with whom he was associated in building the Fortune Theatre and in various other enterprises, including the profitable business of bear-baiting. As his wealth increased, he ceased acting and became a manager. His chief claim to remembrance is as the munificent founder of the College of God's Gift, at Dulwich. His motive in this benefaction has been ascribed by tradition to an apparition of the devil, who appeared to him as he was playing that character in a theatre, but his well-known liberality and the fact that he was childless are more to the point. The college was begun in 1613, and in 1619, after some obstruction on the part of Lord Chancellor Bacon, who wished the King to prefer the foundation of two lectureships at Oxford and Cambridge, it obtained the royal charter. Here for several years Alleyn resided, and managed the affairs of the institution. Alleyn was a friend of Shakespeare and Ben Jonson, and a patron of Dekker (q.v.) and other writers. He was buried in the chapel of the college he had founded, and among its possessions are his portrait and a collection of his business papers. Consult: J. P. Collier, *Memoirs of Edward Alleyn* (London, 1841); J. P. Collier, *Annals of the Stage* (London, 1819); Warner, *Catalogue of the Manuscripts and Muniments at Dulwich College* (London, 1881); and Thomas Fuller, *Worthies of England* (London, 1662).

ALLEYNE, Ellen. A pseudonym under which Christina Georgina Rossetti wrote for *The Germ*.

ALL FOR LOVE, OR THE WORLD WELL LOST. One of Dryden's best-known tragedies, produced in 1678. It is unrhymed, and in some respects is an imitation of Shakespeare's *Antony and Cleopatra*.

ALLGÄU, äl′goi. A subdivision of the European Alps (q.v.) in its widest sense, surrounding the basin of the Iller River in southwestern Bavaria. The name is also applied to the Bavarian districts of Sonthofen and Immenstadt.

ALLGEMEINE ZEITUNG, äl′ge-mī′ne tsī′-tụng (Ger., "general newspaper"). The first German newspaper of a high class. It succeeded in 1798 the *Neueste Weltkunde*, and was published by Cotta (q.v.), who had sought Schiller as editor. The journal became the organ of statesmen and publicists, and has always commanded the services of distinguished literary men as critics and correspondents. First published at Stuttgart, it was successively transferred to Ulm and Augsburg, and is now published at Munich.

ALL HAL′LOWS, College of. A college in Dublin, Ireland, for the training of Roman Catholic missionaries. It derives its name from its situation on grounds which once belonged to the monastery of All Hallows, suppressed by Henry VIII. It was founded in 1842 by Father Hand. One year after its foundation the college had 38 students; in 1906 it had over 180 students. Many of its graduates are active among the Irish Catholics in the United States. Among its professors were Dr. Woodlock, Dr. Moriarty, the Rev. Thomas Potter, and Henry Bedford.

AL′LIA. In ancient geography, a small stream which flowed into the Tiber about eleven miles north of Rome. It is celebrated as the scene of the defeat of the Roman army by the Gauls, under Brennus, about 390 B.C. Immediately afterward, Rome was taken, plundered, and burned. It is difficult to identify the Allia with any of the modern streams; but the evidence seems in favor of the Fosso della Bettina.

AL′LIA′CEOUS PLANTS. Plants of the genus Allium (q.v.), or others nearly allied to it. The term is generally employed to denote not only the possession of certain botanical characters, but also of a certain smell and taste, well known by the term alliaceous, of which examples are readily found in the onion, leek, garlic, and other familiar species of Allium, much employed for culinary purposes. These plants contain free phosphoric acid, and a sulphuretted oil, which is partly dissipated in boiling or roasting. The alliaceous flavor is, however, found also, although in comparatively rare instances, in plants of entirely different botanical affinities—for example, in Sisymbrium alliaria, of the natural order Cruciferæ (see Alliaria); in the young shoots of Cedrela angustifolia, a tropical American tree allied to mahogany; and in certain species of Dysoxylum, of the kindred order Meliaceæ.

ALLIANCE. A city and the county seat of Boxbutte County, Neb., 360 miles west by north of Lincoln, on the Chicago, Burlington, and Quincy Railroad (Map: Nebraska, B 1). It has important stock-raising interests. Population in 1890, 829; in 1900, 2535.

ALLIANCE. A city in Stark Co., Ohio, fifty miles (direct) south-southeast of Cleveland, on the Mahoning River, and at the junction of the Cleveland and Pittsburg and the Pittsburg, Fort Wayne, and Chicago railroads (Map:

Ohio, H 4). Mount Union College (Methodist Episcopal) is located here. Alliance has a large steel plant, and among its extensive manufactures are gun carriages, travelling cranes, boilers, drop forgings, account registers, and asbestos products. It has large railroad shops. Alliance was settled in 1838 as Freedom, but in 1854 was incorporated under its present name. The government is administered under the provisions of the Ohio Municipal Code of 1902. The mayor is chosen biennially, and there is a city council of seven members. Pop., 1900, 8974; 1906 (local est.), 12,000.

ALLIANCE ISRAELITE UNIVERSELLE, ȧl'yäns' ĕs'rȧ'ȧ'lĕt' ụ'nē'vâr'sĕl'. An association founded at Paris in 1860 for the amelioration of the condition of the Jews throughout the world. The original members of the society were Jews, and by far the largest number of its members at present belong to that faith; but the association has enjoyed at all times the sympathy and coöperation of many prominent Christians. As outlined in its prospectus, the programme of the society included the emancipation of the Jews from oppressive and discriminating laws, political disabilities, and defense of them in those countries where they were subjected to persecution. For the attainment of this object the society purposed to carry on a campaign of education through the press and by the publication of works on the history and life of the Jews. In the beginning, however, the course of action adopted by the society for bringing relief to their oppressed brethren in other countries was to secure the intercession of friendly governments in their behalf. Thus, as early as 1867 the governments of France, Italy, Belgium, and Holland made the renewal of existing treaties with Switzerland conditional upon that country's granting full civil and political rights to the Jews. In 1878, representatives of the Alliance laid the condition of the Jews in the Balkan Peninsula before the Congress of Berlin, as a result of which the Treaty of Berlin stipulated that in Rumania, Servia, and Bulgaria no discrimination should be made against any religion in the distribution of civil rights. Of late years the activity of the Alliance has tended to become more educational than political, and the chief problem with which it was occupied at the beginning of the twentieth century was the improvement of the condition of the Jews in the Orient. Schools have been established in Bulgaria, European and Asiatic Turkey, Persia, Tunis, and Morocco. In 1903 the number of such schools was 120, with a teaching staff of about 500 and an attendance of 33,000. Instruction is carried on in the language of the country or in the dialect employed by the majority of pupils. In addition to the cultural schools, 38 manual training workshops have been established for boys, and 22 schools of domestic science for girls, the encouragement of handicrafts among the Jews being one of the chief aims of the Alliance. Two farm-schools have been established, one near Jaffa in Palestine, the other at Djedeida, near Tunis; the former of these has supplied the Jewish colonies in Palestine with skilled agriculturists and supervisors. At Paris there is a normal school for the education of teachers who are exclusively drawn from the schools of the Alliance, and are sent back after a thorough training to carry on in their turn the work of instruction in their native countries. In 1899 the Alliance numbered 32,400 members. The central committee of the Alliance, with its seat at Paris, consisted in 1905 of sixty-six members. Only twenty-nine, however, are resident, the rest being scattered all over the world, five of them residing in the United States. The central committee stands in constant communication with the regional and local committees, of which there are a number in the United States, the principal ones being at New York and Philadelphia. The Alliance publishes monthly bulletins and a semi-annual report in French and German, and at intervals issues reports in English, Hebrew, Hungarian, and Judeo-Spanish.

ALLIANCE OF THE REFORMED CHURCHES HOLDING THE PRESBYTERIAN SYSTEM. An alliance formed in London in 1875. It holds councils, which have no legislative authority but great moral weight. In them the various Augustinian non-prelatical and Presbyterian or Reformed national and denominational churches find representation. There are over ninety of these churches, with 25,000,000 adherents, throughout the world. The reports of the proceedings of these councils are valuable, as papers are read, statistics presented, and many speeches made. In the intervals between councils the business of the Alliance is conducted by an executive commission. The councils have been held at London, 1875; Edinburgh, 1877; Philadelphia, 1880; Belfast, 1884; London, 1888; Toronto, 1892; Glasgow, 1896; Washington, 1899; Liverpool, 1904.

AL'LIA'RIA. A genus of plants of the natural order Cruciferæ, closely allied to Sisymbrium and Erysimum, and ranked by some botanists in the genus Sisymbrium. It is known by the popular names of sauce-alone and jack-by-the-hedge. The best known species, Alliaria officinalis, or, as often commonly called, Sisymbrium alliaria, is a native of Great Britain, not unfrequently found on hedge-banks and in waste places in dry, rich soils, and is common in most parts of Europe. It has also become introduced in a number of places in the United States. It is a biennial, with a stem two to three feet high; large, stalked, heart-shaped leaves, white flowers, and pods much longer than their stalks, which are somewhat spreading. It seems more deserving of cultivation than many other plants which have long received the constant care of the gardener, being wholesome, nutritious, and to most persons pleasant. The powdered seeds were formerly employed as a sternutatory.

AL'LIBONE, SAMUEL AUSTIN (1816-89). An American author. He was born at Philadelphia, and although engaged in commercial pursuits, devoted considerable time to literature. It was therefore as an amateur that he began the literary work to which the best part of his life was devoted. This work, the *Critical Dictionary of English Literature and British and American Authors*, contains notices of 46,599 writers. The first volume appeared in 1854. Allibone was book editor and corresponding secretary of the American Sunday-school Union, from 1867 to 1873. In 1879 he was appointed librarian of the Lenox Library in New York, and held this position until 1888. He died at Lucerne, Switzerland, Sept. 2, 1889. Besides the *Critical Dictionary*, he compiled the following works: *Poetical Quotations from Chaucer to Tennyson*, containing 13,600 passages, taken from 550 authors; *Prose Quotations*, *from Socrates to Macaulay*, with indexes to the 8810 quotations, containing the names of 544 authors and 571 subjects (1876); *Explanatory Questions on the Gospels and the Acts* (1869), *An Alphabetical Index to the New Testament* (1868), *Indexes to Edward Everett's Orations and Speeches* (1850-59).

AL'LICE, or **AL'LIS** (Fr. *alose*, from Lat. *alausa*). A European shad (*Alosa vulgaris*) about twenty inches long, caught for food when ascending the rivers to spawn. It is the larger, and considered the better of the two species of European shad, of which the other is called the twaite. These are the maifisch of the Rhine Valley.

ALLIER, ȧ'lyȧ'. A department in central France (Map: France, K 5). It is formed mainly out of the old province of Bourbonnais. Area, 2850 square miles; population, in 1901, 422,024. Capital, Moulins.

ALLIER. A tributary of the Loire, which has its source in the water-shed in the east of the department of Lozère, France (Map: France, K 6). It flows in a northerly direction, through Haute-Loire, Puy-de-Dôme, and Allier, and after a course of more than 200 miles falls into the Loire below the town of Nevers. It is navigable for 140 miles.

AL'LIGA'TION (Lat. *alligare*, to bind to, tie up). A form of proportion of eastern origin, which appears in the early works of Arabian and Hindu writers, notably in the *Lilavati* of Bhaskara Acharya (c. 1150). The process was for several centuries confined to problems concerning the combination of metals. Two forms of alligation were recognized: viz., alligation *medial* and alligation *alternate*. Alligation medial teaches the method of finding the price or quality of a mixture of several simple ingredients whose prices or qualities are known; e.g., What is the fineness of gold produced by mixing 6 ounces of gold 22 carats fine with 4 ounces of gold 17 carats fine? Alligation alternate teaches what amount of each of several simple ingredients, whose prices or qualities are known, must be taken to form a mixture of any required price or quality; e.g., How much gold 700 fine and 900 fine must be melted together to produce gold 800 fine? Problems of this kind are indeterminate; that is, they have more than one solution, and are best treated by algebraic equations. Alligation in its arithmetic form has practically disappeared from recent text-books, and may be regarded as obsolete.

AL'LIGATOR (Sp. *el lagarto*, the lizard, Lat. *lacertus*, lizard). A genus of reptiles of the family Crocodilidæ. True alligators differ from crocodiles in the following respects: The feet are less webbed, the head is shorter and flatter, the long first and fourth teeth of the under jaw fit into pits in the upper jaw, and not into notches between the teeth, and this causes the whole head to be broader and the snout more obtuse than in crocodiles. There are only three species of alligators, according to Professor E. D. Cope, —the jacare and cayman (q.v.) of Central and South America being classified in a distinct genus. These species are: *Alligator heloïs* (habitat unknown), *Alligator Sinensis*, of China, and *Alligator Mississippiensis*, of the southern United States. Among the Neocene fossils of the south of England are remains of an alligator, or of a form that approaches very near to it; but this single species comprises all extinct species known, showing that the genus may be of modern origin. Their characteristics are largely those of the other crocodilians (see CROCODILE): activity at night, offensive and defensive swinging of the tail, bellowing, egg-laying, etc.; but they are less aquatic than the typical crocodiles, and spend much of their time basking in the sun on land. The alligator of the United States originally ranged from North Carolina to the Rio Grande along the coast, and up the larger rivers, ascending the Mississippi as far as Jefferson County, Miss., about latitude 32°; and in favorable places it used to be enormously abundant. It is now rarely seen north of Florida or the coast swamps of Louisiana; and the constant persecution of it for sport, its hide, ivory, or eggs is fast leading toward its extermination. It is estimated by the United States Fish Commission that 3,000,000 alligators were killed in Florida alone between 1880 and 1900. This alligator reaches about sixteen feet in length when fully grown, and then is greenish black above, having lost the yellowish color-bands that belong to its earlier years. It spends most of the day asleep in the sun on a mud bank or log, slipping into the refuge of the water when disturbed. It is timid and quick to retreat, rarely showing any disposition to attack a man, though boats are sometimes followed. When cornered, or caught upon the hook and hauled ashore, or, as is sometimes done, captured and bound with a rope when asleep, the animal proves an ugly customer, rushing with formidable open jaws at its enemies, and striking from side to side with its powerful tail. They are strong and active swimmers, and always on the lookout for swimming animals like muskrats or dogs, and sportsmen have often lost in this manner dogs that have ventured or been sent into the water after game. Alligators lie in wait in shallows, or close to the shore, for such prey also, yet their main fare is fish, salamanders, and the like. Like other crocodilians, it carries its prey to the bottom to be devoured, and then its windpipe and ears are closed against admission of water. The body of the alligator emits a fetid odor, and its flesh, which is white and tender, has a musky taste, yet is eaten by the Indians and some others. During the colder months it burrows into the swamp mud and hibernates, the depth and length of this torpidity being greater, of course, in the more northerly parts of its habitat. Consult Belt, *Naturalist in Nicaragua* (London, 1888).

The breeding of the alligator is thus described by Dr. Hugh M. Smith (*Bulletin United States Fish Commission*, XI., 1891): "The maternal alligator in April or May seeks a sheltered spot on a bank, and there builds a small mound. The foundation of the mound is of mud and grass, and on this she lays some eggs. She covers the eggs with another stratum of grass and mud, upon which she deposits some more eggs. Thus she proceeds until she has laid from 100 to 200 eggs. The eggs in the course of time are hatched by the sun, assisted by the heat which the decomposition of the vegetable material generates. As soon as they have 'chipped the shell' the baby alligators are led to the water by the mother, who provides them with food which she disgorges, showing much anxiety for their safety. At this early period of their existence they are exposed to many dangers, being a favorite prey of fishes and turtles. Alligators grow very slowly. At fifteen years of age they are only two feet long. A twelve-footer may reasonably be supposed to be seventy-five years old." Alligators are extensively utilized. Their hides can be tanned into an excellent leather, which has become expensive. The teeth, obtained by rotting the skulls in the ground, are of fine ivory, and valued for carving into ornaments. They are worth about $2 a pound (of 50 to 75 teeth). Both flesh and eggs are eaten by some persons, and the eggs are valued because they can be hatched in boxes of warm sand, yielding young alligators to be sold as pets, or killed and made into curious ornaments. See CAYMAN.

ALLIGATOR AP'PLE. See CUSTARD APPLE.

ALLIGATOR FISH. A fish of the family Agonidæ, whose members have an elongated angular body covered with large bony plates that form a coat of mail. The best known one is Podothecus acipenserinus, a species twelve inches long, found on the northern Pacific coast.

ALLIGATOR GAR. The great gar, *Litholepis tristœchus*, of the rivers of the Southern United States, Cuba, Mexico, and Central America, which is greenish in color and sometimes reaches a length of ten feet. See GAR.

ALLIGATOR LIZ'ARD. Any lizard of the iguanid genus Sceloporus, which contains a great number of small species whose heads are not spiny and which have flat scales and no gular fold. They vary in color, but are generally dull above, with one or two light lines along each side and black cross lines or blotches on the back. The inferior surfaces, however, are likely to be brilliantly colored. "The throat and sides of the belly are usually of some shade of blue (sometimes purple). When the animal raises the head, as it habitually does, the brilliant colors of the throat are visible, but those of the sides are much less apparent. All these colors are most conspicuous in the males." (Cope.) These lizards are conspicuous objects everywhere in the southwestern United States and Mexico, running up trees and dodging about the branches, scampering over rocks, hiding in their fissures, or scaling the sides of stone walls and adobe houses. One small species, very variable in color, *Sceloporus undulatus*, is the common "fence lizard" of the eastern and central States. They are exceedingly swift and spry, but perfectly harmless, and increase by means of eggs laid in the sand and left to hatch by the warmth of the sun.

ALLIGATOR PEAR. See AVOCADO PEAR.

ALLIGATOR TER'RAPIN, TORTOISE, or TURTLE. A snapping turtle, especially the long-necked, long-tailed, very large species (*Macrochelys lacertina*) of the southern Mississippi Valley, which may weigh 50 or 60 pounds, and is valued as food. See TURTLE.

AL'LINGHAM, WILLIAM (1824-89). An Anglo-Irish poet, born at Ballyshannon, Donegal. He won attention by *Poems* (1850), some of which had previously appeared in English periodicals. In the same year he came to London and was appointed to a subordinate post in the customs. He received a civil pension of £60 in consideration of his services to literature in 1864; married Helen Patterson, a well-known water-color painter, in 1874, and in the same year became editor of *Fraser's Magazine*. He died at Hampstead. His first collection of poems was followed by *Day and Night Songs* (1854), a new edition of which (1855) was illustrated with woodcuts from designs by Arthur Hughes, Rossetti, and Millais. Among subsequent volumes were *Laurence Bloomfield in Ireland*, an ambitious but unsuccessful narrative poem (1864); *In Fairy Land*, illustrated by Richard Doyle (1870), *Songs, Ballads and Stories* (1877), *The Fairies* (1883), *Flower Pieces, and Other Poems*, with designs by Rossetti (1888). *Mary Donnelly* is perhaps the best known of Allingham's many natural and graceful lyrics.

ALLIOLI, äl'lē-ō'lē, JOSEPH FRANZ (1793-1873). A Roman Catholic biblical scholar. In 1830-36 he issued at Nuremberg, in six volumes, Braun's annotated German translation of the Bible from the Vulgate, but so revised as to be practically a new work. It was the first of its kind to receive Papal approbation.

AL'LISON, WILLIAM BOYD (1829—). An American legislator. He was born at Perry, O., attended Allegheny and Western Reserve colleges; studied law and practiced in Ohio until 1857, when he removed to Iowa. During the Civil War he was a member of the Governor's staff. Elected as a Republican, he served in the House of Representatives from 1863 to 1871; was elected to the United States Senate, in 1872, and has been reëlected five times. He has been an active member of the Senate, serving on many commissions. The essential feature of the coinage act of 1878, known as the Bland-Allison Act, or more properly the Allison Act, was due to him. He was one of the representatives of the United States at the Brussels Monetary Conference, in 1892. He has several times been a prominent candidate in Republican national conventions for the Presidential nomination. Both President Garfield and President Harrison offered him the Treasury portfolio.

ALLIT'ERA'TION (Lat. *ad*, to + *littera*, letter). The frequent occurrence of the same or similar letters or sounds. In old German, Anglo-Saxon, and Scandinavian poetry, alliteration took the place of rhyme. This kind of verse, in its strict form, required that two stressed syllables in the first hemistich and one in the second hemistich should have the same sound, if consonantal, as in the following Anglo-Saxon line:

*F*lota *f*āmig heals *f*ugle gelicost.
(The *b*oat with *b*ow of *f*oam likest a *b*ird.)

Alliterative poems continued to be written in English after it had assumed its modern form. The most remarkable is *Piers Plowman*, a poem of the fourteenth century, of which the following is a specimen:

In a *s*omer *s*eson whan *s*oft was the *s*onne.

Even after the introduction of rhyme, alliteration continued to be largely used as an embellishment of poetry, and is so, though to a less extent, to this day:

The fair *b*reeze *b*lew, the white *f*oam *f*lew,
The *f*urrow *f*ollowed *f*ree.—*Coleridge.*

Alliteration is not confined to verse; the charm that lies in it exercises great influence on human speech generally, as may be seen in many current phrases and proverbs in all languages: example, "life and limb," "house and home," "wide wears," "tight tears," etc. It often constitutes part of the point and piquancy of witty writing. Among modern writers this use of alliteration is well illustrated by Sydney Smith; for example, when contrasting the conditions of a dignitary of the English Church and of a poor curate, he speaks of them as "the right reverend Dives in the palace, and Lazarus-in-orders at the gate, doctored by dogs and comforted with crumbs."

In the early part of the seventeenth century the fashion of hunting after alliterations was carried to an extreme; even from the pulpit, the chosen people of God were addressed as "the chickens of the Church, the sparrows of the spirit, and the sweet swallows of salvation." *Ane New-Year Gift*, or address, presented to Mary, Queen of Scots, by the poet Alexander Scott, concludes with a stanza running thus:

Fresh, fulgent, flourist, fragrant flower formose,
Lantern to love, of ladies lamp and lot,
Cherry maist chaste, chief carbuncle and chose, etc.

In the following piece of elaborate trifling, given (but without naming the author) in H. Southgate's *Many Thoughts on Many Things*, alliteration is combined with acrosticism:

A n Austrian army, awfully arrayed,
B oldly by battery besieged Belgrade;
C ossack commanders cannonading come,
D ealing destruction's devastating doom;
E very endeavor engineers essay
F or fame, for fortune, forming furious fray.
G aunt gunners grapple, giving gashes good;
H eaves high his head heroic hardihood;
I braham, Islam, Ismael, imps in ill,
J ostle John Jarovlitz, Jem, Joe, Jack, Jill;
K ick kindling Kutusoff, kings' kinsmen kill
L abor low levels loftiest, longest lines;
M en march 'mid moles, 'mid mounds, 'mid murd'rous mines.
N ow nightfall's near, now needful nature nods,
O pposed, opposing, overcoming odds.
P oor peasants, partly purchased, partly pressed,
Q uite quaking, "Quarter! quarter!" quickly quest.
R eason returns, recalls redundant rage,
S aves sinking soldiers, softens signiors sage.
T ruce, Turkey, truce! truce, treach'rous Tartar train!
U nwise, unjust, unmerciful Ukraine,
V anish, vile vengeance! vanish, victory vain!
W isdom wails war—wails warring words. What were
X erxes, Xantippe, Ximenes, Xavier?
Y et Yassy's youth, ye yield your youthful yest.
Z ealously, zanies, zealously, zeal's zest.

While recent poets, as Tennyson and Swinburne, employ alliteration combined with vowel distribution, for beautiful sound effects, yet prose writers seem to avoid it, or at least to keep it from becoming obvious. Observe from the *Passing of Arthur:* "And on a sudden, lo! the level lake, and the long glories of the winter moon." Consult: Guest, *English Rhythms* (London, 1882); and J. Schipper, *Grundriss der Englischen Metrik* (Leipzig, 1895). See ENGLISH LITERATURE.

AL′LIUM (Lat., garlic). A genus of plants of the natural order Liliaceæ containing about 250 species of perennial—more rarely biennial—herbaceous plants, with more or less decidedly bulbous roots, natives chiefly of the temperate and colder regions of the northern hemisphere. The flowers are umbellate, with the umbel often bearing also small bulbs along with its flowers. The leaves are generally narrow, although in some species, as Allium ursinum, they are rather broad, and in many species they are rounded and fistulose. Garlic, *Allium sativum,* Onion (q.v.), *Allium cepa,* Leek (q.v.), *Allium porrum,* Shallot (q.v.), *Allium ascolonicum,* Chive (q.v.), *Allium schœnoprasum,* and Rocambole (q.v.), are species of this genus in common cultivation. The first four are cultivated in the gardens of India as well as Europe, along with Allium tuberosum; and the hill-people of India eat the bulbs of Allium leptophyllum, and dry the leaves, and preserve them as a condiment. A number of other species are occasionally used in different countries. Eight or nine species are natives of Britain, of which the most common is Ramsons (*Allium ursinum*), a species with much broader leaves than most of its congeners. It is most frequently found in moist woods and hedge-banks, but occasionally in pastures, in which it proves a troublesome weed, communicating its powerful odor of garlic to the whole dairy produce. Crow garlic, or Wild Onion (*Allium vineale*), another British species, is sometimes very troublesome in the same way in drier pastures. Both are perennial, and to get rid of them their bulbs must be perseveringly rooted out when the leaves begin to appear in spring. This species has been introduced into the eastern part of the United States, where it is troublesome in lawns, parks, and pastures. A small quantity of carbolic acid injected into the cluster is said to destroy them. A large number of species are indigenous to the United States, the more common being Allium Canadense, Allium cernuum, Allium tricoccum; which latter has flat leaves one to two inches broad, and five to nine inches long; Allium reticulatum, which has its bulbs covered with a dense fibrous coat, etc. A number of species are grown in-doors or as ornamental plants in gardens. Among these Allium Neapolitanum is one of the best. If grown out-doors it needs protection in most localities in the United States.

ALLMAN, ạl′man, GEORGE JAMES (1812-98). A Scotch zoölogist. He was born in Ireland, graduated in 1844 at Trinity College, Dublin, and was in the same year appointed regius professor of botany in Dublin University. In 1855 he was appointed regius professor of natural history in Edinburgh University, and having resigned in 1870, was chosen president of the Linnæan Society in 1874, and president of the British Association in 1879. He received numerous medals from the scientific societies, and published *Monograph of the Fresh Water Polyzoa* (1856), and *Monograph of the Gymnoblastic Hydroids* (1871-72).

ALLMERS, äl′mĕrs, HERMANN LUDWIG (1821-1902). A German author, born at Rechtenfleth. He studied at Berlin, Munich, and Nuremberg, and made his first appearance in literature in his *Marschenbuch* (1858). This was followed by *Dichtungen* (1860), and *Kömische Schlendertage* (1869), containing observations on Italian life. His drama, *Elektra* (1872), with music by A. Dietrichs, was very successful. His further works include *Fromm und Frei* (1889), a volume of verse. His complete works appeared in 1891-95. Consult L. Bräutigam, *Der Marschendichter Hermann Allmers* (Oldenburg, 1891).

ALL′MOUTH. The angler or goosefish. See ANGLER.

ALLOA, ăl′lō-ȧ. A seaport and the county town of Clackmannanshire, Scotland, at the mouth of the Forth, about 6 miles east of Stirling (Map: Scotland, E 3). It is a town of considerable antiquity, and is an active centre of trade and manufactures. The principal articles manufactured are whisky, ale, cotton, woolen goods, glass and iron. Considerable coal is obtained from the neighboring collieries. Alloa has an excellent harbor, with floating and dry docks. There is regular steamer communication by river with Edinburgh and Stirling. In the neighborhood is Alloa House, supposed to have been built in the thirteenth century, the home of the Earls of Mar and the Erskines, and many Scottish princes. Population of police burgh, 1901, 11,417.

ALLOB'ROGES (Lat. pl.). A people of Gaul whose territory is now Savoy and Dauphiné. Vienna (the modern Vienne) was their chief town. They were subjected to Rome 121 B.C., by Fabius Maximus, and remained loyal.

AL'LOCU'TION (Lat. *allocutio*, a speaking to, from *ad*, to + *loqui*, to speak). A term applied, in the language of the Vatican, to denote specially the address delivered by the Pope at the College of Cardinals on any ecclesiastical or political circumstance. It may be considered as corresponding in some measure to the official explanations which constitutional ministers give when questions are asked in the British Parliament. They are published by being put up on the doors of St. Peter's, Rome.

ALLO'DIUM, or ALLODIAL TENURE (Med. Lat. probably from O. H. G. *al*, all + *ōt*, *ōd*, property, estate). The free and absolute right of property in land, properly opposed to feudal tenure (q.v.), or the holding of land in subordination to a superior owner. Blackstone is responsible for the view, which has been generally taken by legal writers of the last century, that a condition of allodial land holding prevailed in England prior to the Norman Conquest, and that this was rapidly superseded by the introduction of the feudal system of land tenure by the Conqueror and his immediate successors, whence Lord Coke's statement that there "is no land in England in the hands of any subject but it is held of some lord by some kind of service." There can be no question as to the universality of feudal tenure, as described by Coke; but it may be doubted whether, in our legal system, the free and unqualified ownership of land—corresponding to the title by which goods and chattels are held—has ever been generally recognized. It is more than probable that from the first the idea of ownership underwent a change when it was transferred from cattle and other personal property to land, and that the owner of land was generally conceived of as having a more or less temporary interest, as holding in subordination to the superior rights of the community, which was somehow regarded as the ultimate and permanent owner. However this may be, we do not find in the books any general recognition of allodial ownership, in the strict sense of the term, anywhere in Europe; and the rapidity with which the feudal system spread over England after the Conquest would seem to indicate that among the Anglo-Saxons such absolute ownership of land was the exception rather than the rule. The terms *alod* and *allodium* do, indeed, occur with some frequency, but usually in a derivative sense, to describe lands which, though held in some form of dependent tenure, are inheritable and thus similar to the modern estate in fee simple. Since the decay of the feudal system in England and its general abolition in the United States, the term "allodial" has come to be applied to the common form of land tenure in subordination to the paramount title of the State, which now commonly prevails, and which, though not entirely free and absolute, has been divested of all the burdensome incidents which were characteristic of feudal tenure. Some of our State constitutions and many of our statutes have expressly declared all tenures to be allodial, in this sense of the term, and in most of the States they are, in the absence of legislation on the subject, deemed to be so. In several of the States, however, tenures partaking more or less of the feudal character still survive. Consult the authorities referred to under REAL PROPERTY.

ALLOG'AMY (Gk. ἄλλος, *allos*, other + γάμος, *gamos*, a wedding) or CROSS-POLLINATION. A transfer of the pollen of one flower to the pistil of another. Allogamy is subdivided into geitonogamy, in which the pollinated flower is on the same plant, and xenogamy, in which it is on a different plant. The opposite of allogamy is autogamy, or self-pollination. See POLLINATION.

ALLON, ăl'lon, HENRY, D.D. (1818-92). An English Congregational leader, born at Welton, near Hull. He graduated at Chestnut College, 1843, and was pastor of Union Chapel, Islington, London, from 1844 until his death. He edited the *British Quarterly Review* from 1865 to 1887. He published, besides sermons, the life of Rev. James Sherman (London, 1863), and that of Thomas Binney, prefixed to his edition of Binney's sermons (1875), and *Land and the Puritans* (1882). He compiled *The Congregationalist Psalmist*. Consult his memorial (1892).

ALLONGÉ, ȧ'lôɴ'zhȧ', AUGUSTE (1833—). A French landscape artist. He was born in Paris and studied with Léon Cogniet. He is chiefly noted for his charming use of charcoal in landscape work, but his oil paintings, as well, have won approval. His method of using charcoal has almost created a 'school' for workers in that material, and his drawings are much sought and highly prized by connoisseurs. His subjects are landscapes of a placid and sylvan kind. Among his works in oil are views on the Somme; among those in charcoal are "Moulin de Givry." He exhibited very regularly after 1855. His writings include *Le fusain* (1873) and his later *Grand cours de fusain* (54 plates).

ALLOP'ATHY. See HOMŒOPATHY.

ALLOPHANE. A hydrous aluminium silicate belonging in the clay group of minerals. It is usually found in amorphous incrustations of a pale sky blue color, but sometimes various shades of green, brown, or yellow. Allophane is produced by the alteration of some aluminous silicate, such as one of the feldspars. It occurs in various European localities and at Richmond, Mass., Bristol, Conn., and Morgantown and Friedenville, Pa.

AL'LOPHAN'IC ACID. See UREAS, THE COMPOUND.

ALLORI, ȧl-lō̆'rê. The name of two Italian painters, of the later Florentine school. ALESSANDRO (1535-1607), a pupil of his uncle Bronzino, afterwards adopted a mannered imitation of Michelangelo. He was chiefly employed in the public buildings of Tuscany, and wrote for artists a treatise on anatomy. His son and pupil CRISTOFANO (1577-1621) forsook Alessandro's manner for that of Pagani. A more important artist than his father, although his style is mannered, he shows delicacy of execution. His most celebrated work is "Judith with the Head of Holofernes" in the Pitti Palace, Florence, with replicas in Vienna and the Uffizi. The Pitti collection also has a fine "Saint Julian," the Louvre "Isabella of Aragon pleading with Charles VIII."

ALLOT'ROPY (Eccl. Gk. *ἀλλοτροπία*, *allotropia*, variety, from ἄλλος, *allos*, other + *τροπος*, *tropos*, turn, way, guise), or ALLOTROPISM. A term used in chemistry to denote the existence of an element in several forms differing from each other in their physical properties. By the silent discharge of electricity in an atmosphere containing ordinary oxygen, the latter is transformed into ozone. Ozone can be readily shown to be made up of nothing but the element oxygen; yet oxygen gas and ozone exhibit important differences in their properties; thus ozone (Gk. *ὄζων*, smelling) has a peculiar and characteristic odor, while oxygen gas is odorless; ozone reacts much more readily with various substances; it has bleaching and disinfectant properties not possessed by oxygen gas, and it is much denser than oxygen. Phosphorus affords another example of allotropism. In ordinary circumstances, and when freshly prepared, phosphorus is a pale yellow solid of the consistence and aspect of wax, and to some extent flexible and translucent. It requires to be placed in a vessel with water to keep it from taking fire spontaneously, and it is very poisonous. The same element, when dried and kept for some time at a moderately high temperature, passes, weight for weight—without addition or subtraction of matter—into a substance known to chemists as *amorphous* phosphorus. The color of this new variety is brownish red; and it exists as a powder, which has no odor, does not take fire, and is not known to be poisonous at all. Three allotropic modifications of the element carbon are known: diamond, graphite, and amorphous carbon (pure lampblack). The different varieties of sulphur, boron, silicon, etc., furnish other examples of allotropism. Though comparatively few elements have been obtained in more than one form, there seems to be no reason why, in general, any other chemical element should be incapable of existing in two or more allotropic modifications. The existence of allotropic varieties brings to the mind the polymorphism of crystalline substances and the isomerism of organic compounds. From the point of view of the atomic theory, the different allotropic modifications of an element are, probably, made up of molecules containing different numbers of atoms, or else of atoms differently combined: thus a molecule of ordinary oxygen contains two oxygen atoms, and its chemical symbol is O_2; a molecule of ozone contains three oxygen atoms, and its chemical symbol is O_3. A similar explanation of the nature of allotropy in solid elements is, however, purely hypothetical; for nothing at all is known of the ultimate structure of solids. Consult: D. Berthelot, *De l'allotropie des corps simples* (Paris, 1894); and Ouvrard, *États allotropiques des corps simples* (Paris, 1894).

ALLOTTAVA. ăl'lôt-tä'vȧ (It., at the octave). A mark *all. 8va.*, or *8va.*, placed over the notes in pianoforte music, signifies that they are to be played an octave higher than written, or, if placed below the notes, an octave lower. Its duration is indicated by a dotted line. In orchestral scores, *all. 8va.* signifies that one instrument plays in octaves with another; in figured bass, that no harmonies are to be employed, the upper parts simply doubling the bass in octaves.

ALLOUEZ, ȧ'lo͞o'ȧ', CLAUDE JEAN (1620-90). One of the early French Jesuits who visited the Great Lakes. He founded the Mission of the Holy Ghost on Lake Superior in 1665, explored Green Bay, and established missions among the Illinois Indians, settling at Kaskaskia (q.v.), and continuing there the mission begun by Marquette. He retired in 1679 on the approach of La Salle, an enemy of the Jesuits, and died among the Miamis on St. Joseph's River. An autobiographic account of his work can be found in the Jesuit *Rélations*, published at Cleveland, O., in 1900.

ALLOW'ANCE. In military usage, money allowed in lieu of forage, food, horses, clothing, or quarters; or for any extra work or duties that may have been performed. Such allowance constitutes extra pay. See PAY AND ALLOWANCES, MILITARY.

ALLOWANCE OF QUAR'TERS. See PAY AND ALLOWANCES, MILITARY.

AL'LOWAY KIRK. An old ruined church in the parish of Ayr, Scotland, near the mouth of the Doon, celebrated in Burns's *Tam o' Shanter*. At very short distances from it are the cottage in which the poet was born, the monument erected to his memory in 1823, and the Auld Brig o' Doon, over which Tam o' Shanter made his escape.

ALLOY' (Fr. *aloi*, from Lat. *alligare*, to bind to, from *ad*, to + *ligare*, to tie). A mixture of two or more metals, usually produced artificially by fusion, although sometimes found native. Alloys are characterized by certain definite properties, which, according to Sir William C. Roberts-Austen, include: Liquation, which is shown by the separation of that constituent which has the lowest melting point when the alloy is heated; density, which seldom corresponds to the mean of those of the constituents of the alloy, being usually either more or less than that shown by the percentage composition; tenacity, which is usually greater than that of the constituents of the alloy, although it is sometimes diminished; hardness, which is almost always increased; extensibility, which is almost always diminished; and fusibility, the melting point being generally lower than the mean of the melting points of the constituent metals.

The great value of metallic alloys in commerce is due to the fact that certain properties which are desirable for practicable purposes may be imparted to many metals by a suitable addition of other metals. For instance, gold and silver are too soft for use as coins when pure, but may be rendered sufficiently hard by the admixture of small proportions of copper. Similarly the hardness of copper is greatly increased by the addition of zinc, yielding brass. In making alloys, the least fusible metal is melted first, after which the others are added. When three metals are used to form the alloy, they are melted in pairs and afterward together. The more important metallic alloys, which are included among the materials of constructive engineering, are the bronzes, the brasses, the coin alloys, and a few alloys of tin, lead, zinc, antimony, and bismuth. The following are the principal alloys, their composition and uses:

Bronze is an alloy of copper and tin. The knowledge of bronze is very old, it being used by the ancients for making coins, weapons, tools, and ornaments. Many of these ancient peoples were very skillful bronze founders. The principal bronzes are those used in coinage, in ordnance, in statuary, in bells and musical instruments, and in mirrors and the specula of telescopes. *Coin bronze* as made by the Greeks and Romans consisted of from 96% copper and 4% tin, to 98% copper and 2% tin. Modern investigations have shown the range of good alloys for this purpose to be quite large, varying from 96% copper and 4% tin to 80% copper and 14% tin, the best falling near the middle of this range. *Gun bronze* has different compositions in different countries, but the most common proportion would seem to be 90% copper and 10% tin, or 89% copper and 11% tin. When well made it is solid, yellowish in color, denser than the mean of its constituents, and much harder, stronger, and more fusible than commercial copper; it is somewhat malleable when hot and much less so when cold. *Statuary bronze* is nearly the same composition as gun bronze. It should be rapidly melted, poured at a high temperature, and quickly cooled to get the best results. *Bell metal* is richer in tin than the preceding, and varies in composition somewhat with the size of the bell, the proportion of tin being the larger in the case of small bells. The range of good practice in bell metal is from 18% to 30% tin and from 82% to 70% copper. Chinese gongs are made from 78% to 80% copper and 22% to 20% tin, and are beaten into shape with the hammer, being tempered at intervals during the process. (See Annealing.) Bell metal is dense and homogeneous, fine ground, malleable if quickly cooled in the mold, rather more fusible than gun bronze, but otherwise similar, exceiling, however, in hardness, elasticity, and sonority. *Speculum metal* contains often as much as 33% tin; it is almost silvery white, extremely hard and brittle, and capable of taking a very perfect polish. Bronze for bearings and other friction surfaces in machinery is made of many proportions, varying from 88% to 96% copper, as more or less hardness is required. *Phosphor bronze* is a triple alloy of copper, zinc, and tin, which has been given exceptional purity by fluxing with phosphorus. It is very tough and hard, and is used for piston rings and valve covers, pinions, cog wheels, screw propellers, etc. *Tobin bronze* is an alloy of copper and zinc in the proportion of about 59 to 38, with small percentages of tin, iron, and lead. It has great tensile strength, and corrodes with great difficulty. *Aluminum bronze* consists of 90% copper and 10% aluminum, and is an exceedingly tenacious material. *Manganese bronze* is an alloy consisting of about 88 % copper, 1½% tin, 8.7% zinc, and smaller percentages of iron, lead, and phosphorus; it is much used for making screw propellers. Both Tobin bronze and manganese bronze are in reality more nearly brasses, since the zinc percentage is greater than the tin percentage.

Brass is an alloy of copper and zinc varying in proportions from 10 parts of copper to 1 of zinc to 1 part of copper to 5 parts of zinc (see Brass). Brass is extensively employed in the arts in the manufacture of scientific apparatus and mathematical instruments, the small parts of machinery, and many sorts of hardware. It is also drawn into wire, and rolled into sheets and rods, which are used for a multitude of purposes. Brass is harder than copper, very malleable and ductile, and can be "struck" in dies, formed in molds, or "spun" in lathes into vessels of a wide variety of forms. It is a much poorer conductor of electricity and heat than copper, and is more fusible. *Aluminum brass* is made of equal weight of aluminum bronze, copper, and zinc. It has a very high tensile strength, and has been used for screw propellers.

Other alloys than bronzes and brasses exist in an immense variety, and have numerous applications in the arts and sciences, although they are much less used than the bronzes and brasses. Only a few of these alloys can be mentioned here. *German silver* is an alloy of copper, zinc, and nickel in the respective proportions of about 60%, 20% and 20%. It is used for table utensils, ornaments, and in the form of sheets, and is one of the most difficult alloys to handle in the foundry and rolling mill. *Pewter* is an alloy of tin and copper often mixed with lead. *Britannia metal* is an alloy of tin, antimony, copper, and brass. It and pewter are much used in making table utensils. *Stereotype metal* is an alloy of 16% antimony, 17% tin and 67% lead. (See Printing.) *Babbitt metal* is an alloy of 4 parts copper, 12 parts tin, 8 parts regulus of antimony melted together, and 12 parts tin added after fusion. It is used for lining bearings for journals. *Solders* are alloys used for joining metallic surfaces and parts, and have a wide range of composition. The soft solders are made of tin and lead; the hard solders are usually made of brass, and special solders are composed of various alloys of copper, zinc, lead, tin, bismuth, gold, and silver. In making solders, great care has to be taken to secure uniformity of composition. For this reason, they are often granulated by pouring from a height into water, or by reducing the cast ingots into powder and then remelting the granulated or powdered material. The soft solders are usually sold in sticks, and silver and gold solder in sheets. Platinum is soldered with gold, and German silver with a solder of equal parts of silver, brass, and zinc. The essentials of a good solder are that it shall have an affinity for the metals to be united, shall melt at a considerably lower temperature, shall be strong, tough, uniform in composition, and not readily oxidized. *Type metal* is an alloy of lead and antimony in the proportions of 4 to 1. It is a hard alloy capable of being cast in molds, and taking form very perfectly. *Gold coin* consists of an alloy of 900 parts gold, 75 parts copper, and 25 parts silver. Iron forms compounds with many elements that are used in metallurgical processes, as ferro-manganese, ferro-titanium, and ferro-tungsten, which will be considered under Iron and Steel. Mercury combines with many metals to form amalgams (q.v.). During the years 1875-78, a board for testing iron, steel, and other metals met at the Watertown Arsenal, Mass., and very thoroughly considered the properties of various alloys. Their report, published in 1881, contains much information on the subject, together with a bibliography. Consult: Guettier, *A Practical Guide for the Manufacture of Metallic Alloys*, translated by Fesquet (Philadelphia, 1872); Larkin, *The Brass and Iron Founders' Guide* (Philadelphia, 1878); Graham, *The Brassfounders' Manual* (London, 1879); Brannt, *Metallic Alloys* (London, 1889); Hiorns, *Mixed Metals, or Metallic Alloys* (New York, 1890); Thurston, *A Treatise on Brasses, Bronzes, and Other Alloys and Their Constituent Metals* (New York, 1897); Roberts-Austen, "Reports to the Alloys Research Committee," *Proceedings, Institution of Mechanical Engineers* (London, 1891, '93, '95, '97, '99, and 1904); and Howe, *Iron, Steel, and other Alloys* (Boston, 1903).

ALLOYS, Magnetic, Composed of Non-Magnetic Metals. Hadfield has discovered that the addition of a certain amount of Manganese to iron renders the latter perfectly non-magnetic. In 1904, Heusler made the very remarkable discovery that, conversely, certain non-magnetic metals may be rendered magnetic by alloying them with manganese — itself perfectly non-magnetic. Thus, copper, aluminium, and antimony are on the list of distinctly non-magnetic metals. Yet an alloy containing 60 per cent. of copper, 14 of aluminium, and 26 of manganese is magnetic. Furthermore, and curiously enough, the magnetic property of the alloy may be readily caused to vary. When freshly prepared, the alloy is but faintly magnetic. If heated to 170° C. (ca. 340° F.) and then suddenly chilled with water, it loses its magnetic property altogether. But if subsequently kept for some time at the temperature of boiling water, or thereabout, it becomes more permanently, and this time quite strongly, magnetic. Alloys of manganese with antimony, too, are distinctly magnetic. An adequate theoretical interpretation of these facts is in the present state of science impossible. The conclusion, however, to which they point is, that magnetisability is rather an acquired and variable than an inherent and constant property of matter, and that its ultimate cause may lie, not deeply within the chemical atoms, but rather in the physical conditions produced, as it were, accidentally in certain molecular complexes. This conclusion suggested to Clemens Winkler a possible analogy in radioactivity, and he raised the question whether radioactivity, too, might not be a more or less accidental physical rather than a deep-heated chemical property of substances, and whether radium itself might not be simply common barium with the property of radioactivity acquired.

ALL-SAINTS' BAY. A bay in the province of Bahia, Brazil, in 12° to 13° S. lat., and 38° to 39° W. long. (Map: Brazil, K 6). It forms a superb natural harbor, 37 miles long and 27 miles broad, with an easy entrance. It contains several islands, the largest of which, Itapasica, is 18 miles long and 3 miles broad. The town of Bahia (q.v.) lies just within it.

ALL-SAINTS' DAY. In old English, All-Hallows, All-Hallowmas, or simply Hallowmas, a festival of the ancient Christian Church, introduced because of the impossibility of keeping a separate day for every saint. As early as the fourth century, on the cessation of the persecution of the Christians, the Sunday after Easter was appointed by the Greek Church for commemorating the martyrs generally; and in the Church of Rome a similar festival was introduced about 610 A.D., when the old heathen Pantheon (the present Rotunda, or Santa Maria de' Martiri) was consecrated, on March 13, to Mary and all the martyrs. But the real festival of All Saints was first regularly instituted by Gregory IV., in 835, and appointed to be celebrated on November 1st. It was admitted into England about 870, and is now a well-recognized day there and wherever the Church calendar is closely followed. The choice of the day was doubtless determined by the fact that a chapel in Saint Peter's Church in honor of all the saints was consecrated by Gregory III., in 731, on November 1st, which established the date of the Roman observance. In conformity with this local custom Gregory IV. ordered the first of November to be universally observed for the commemoration.

ALL SOULS COL'LEGE. A college of the University of Oxford, founded in 1437-38 by Archbishop Chichele, partly as a chantry where prayers should be made for the souls of all Christians (especially such as fell in the war for the crown of France, of which Chichele had been the adviser), and partly as a society of fellows free from the charge of undergraduate students. The college has been noted for the devotion of its members to history and law, subjects in which the founder was distinguished. In late years, the number of fellowships has been increased from forty to fifty, and two Chichele Professorships have been instituted, one in international law and diplomacy, with one in modern history. The fellows are selected because of their distinction in the study of law and history. Among the ecclesiastics who have here been enrolled are Sheldon, Jeremy Taylor, and Reginald Heber; among lawyers and statesmen, Blackstone, Gladstone, Salisbury, and Curzon. The Codrington Library contains over seventy thousand volumes, and is noted as one of the finest law libraries in England.

ALL-SOULS' DAY. A holy day of the Roman Catholic Church, which falls on November 2d. The object of it is by prayers and almsgiving to alleviate the sufferings of souls in purgatory. For long no especial day was appointed for the commemoration of all the departed who have not attained to perfect life. Among the early Christians the names of the departed were entered on the diptychs, or lists, used at the altar, from which the priest read the names of those for whom he was required to pray that God might give them "a place of refreshment, light, and peace." In the sixth century it was customary in Benedictine monasteries for a commemoration of all the departed brethren to be held at Whitsuntide. In Spain the memorial of All Souls was celebrated in the time of Saint Isidore on the octave of Pentecost; this seems a Western echo of the Oriental custom of commemorating All Saints on that day, and All Souls on the Saturday before Whitsunday. Saint Odilo of Clugny, in 998, ordered that in all monasteries affiliated to Clugny the commemoration of All Souls should follow on the morrow of the Feast of All Saints. Thence the observance of November 2nd as All Souls' day spread throughout the West as a universal custom.

ALL'SPICE (*all* + *spice*). A name given to the dry berry of the pimento (*Pimenta officinalis*), a small evergreen tree. The berry is supposed to combine the flavor of several spices, especially cinnamon, nutmeg, and cloves; hence the name. The tree is cultivated in the West Indies, especially in Jamaica, for its aromatic leaves and berries. The berries grow in clusters. They are about the size of peas, and are used as a spice for seasoning food. The word allspice is also applied to the aromatic bark of various other plants, particularly Calycanthus floridus (q.v.). For illustration, see Plate of Abutilon.

ALL'STON, Theodosia Burr. See Burr, Theodosia.

ALLSTON, Washington (1779-1843). A distinguished American painter and author. He was born at Waccamaw, S. C., on his father's plantation, November 5, 1779, but passed his childhood and received his education and early instruction in art at Newport, Boston, and Cambridge. Malbone, the miniature painter, was an early friend and adviser, and the portraits of Pine a valuable influence. After graduating from Harvard in 1800, Allston went to Charleston, S. C., where he began his art career. In 1801 he went with Malbone to London, and became a student of the Royal Academy, which was at that time under the presidency of his fellow countryman, Benjamin West. In 1804 he visited Paris in company with the afterward celebrated painter Vanderlyn. Here, before going to Italy, he studied in the Louvre the masterpieces of the various schools, and showed a decided preference for the rich, glowing color of the Venetians. This influence held more or less through life, and his natural affinity with those masters of color gave him later the sobriquet of "The American Titian." He passed four years in Rome, the companion of Thorwaldsen and Coleridge, studying the great masters and acquiring their dignified and lofty style, for which he was peculiarly fitted by temperament. He returned to America in 1809, married a sister of Dr. William Ellery Channing, and went again to London, where he painted and exhibited with marked success for seven years. Failing in health, he came home in 1818, and settled first in Boston, afterward in Cambridge, where he passed the remainder of his life in comparative seclusion on account of enfeebled health. He attracted to him always a refined and cultivated circle of friends and admirers; for Allston was a man of scholarly tastes, a rare talker, and a writer of much charm. His temperament was nervous and high-strung. His cast of mind was eminently artistic, imaginative, and of a noble tenor. One of the earliest of his important canvases, "The Dead Man Revived," he painted and exhibited in London about 1810. This obtained a prize of 200 guineas, and was soon after purchased by the Pennsylvania Academy of the Fine Arts. Then followed a number of historical and imaginative works: "St. Peter Liberated by the Angel," "Uriel in the Sun," for which the British Institution awarded him a gratuity of 150 guineas. In America, after his final return, he painted "The Prophet Jeremiah," now at Yale College, his large unfinished "Belshazzar's Feast," now in Boston, and several smaller works, including "Dante's Beatrice," and "Spalatro's Vision of the Bloody Hand," a powerfully dramatic work. His poem, *The Sylphs of the Season*, was delivered before the Phi Beta Kappa Society at Cambridge, and subsequently published in London (1813). He wrote also a novel, *Monaldi* (Boston, 1841). His *Lectures on Art* appeared after his death. He died at Cambridge, July 9, 1843, and his burial took place by torchlight. For his biography consult the volume on him in Sweetser's "Artist Biographies" (Boston, 1879), and the *Life and Letters* published by his relative, J. B. Flagg (New York, 1892).

ALL'S WELL THAT ENDS WELL. A comedy by Shakespeare, produced in 1601, but probably largely written as early as 1595. It was included in the folio of 1623. The plot is based upon a story in Boccaccio's *Decameron*, which had been already borrowed in Painter's *Palace of Pleasure*. Shakespeare, however, added the comic characters of Lafeu, Parolles, and the clown, though without transforming the pathos of the original tale.

ALL-THE-TAL'ENTS MIN'ISTRY. A complimentary designation bestowed by its friends on the English ministry formed by Lord Grenville in 1806. Used in derision by its opponents, it has passed into history as an ironical appellation.

ALLU'VION (Lat. *alluvio*, a washing upon, from *ad*, to + *luere*, to wash). The legal term for land gained from the sea or other waters, public or private, by the imperceptible reliction of the water boundary or the gradual washing up of silt and earth, the scientific and popular term for which is *alluvium*. Alluvion is an accretion (q.v.) to the upland, and becomes part and parcel of the land to which it is annexed, and the property of the owner of the latter. When the change effected by the water is sudden, or so rapid as to be perceptible from day to day, as where the line of the seashore is altered by a storm, or a river suddenly changes its course, or where the deposit, however gradual, is the intentional result of artificial causes, it is not an alluvion or accretion, and the title to the land so covered or uncovered is not affected. Thus, if the sea suddenly engulfs a tract of upland, the land continues to be the property of its former owner, even though it remain permanently submerged. The division of alluvion between adjoining riparian proprietors, whose division line, if projected, would cut it, is a matter of some difficulty. Among several rules which have been adopted, the simplest is that which on private streams prolongs the division line at right angles with the middle line or thread of the stream. As such middle line is the boundary between opposite riparian proprietors, an island formed in the stream belongs to the proprietor on whose side of the line it lies. If this line cuts the island, the latter is divided by the line. Consult: Angell, *Treatise on the Law of Watercourses* (Boston, 1877); Gould, *Treatise on the Law of Waters* (Chicago, 1900). See AVULSION; RIPARIAN RIGHTS; SEASHORE; WATER RIGHTS.

ALLU'VIUM (From Lat. *ad*, to + *luere*, to wash). A term applied to the sediment transported by rivers and spread over submerged lowlands during periods of flood. This alluvium sometimes forms "flood plains" bordering rivers, or builds up conical heaps, "alluvial cones," at points where rivers debouch from narrow valleys on to lower areas, or constitutes deltas at river mouths. Alluvial soils are among the most productive known, because of the additional fresh material applied to their surfaces during periods of high water. The flood plains of the Nile, Ganges, and Mississippi are illustrations. See DELTA; FLOOD-PLAIN; RIVER; SOIL.

ALL'WORTH, LADY. In Massinger's play, *A New Way to Pay Old Debts* (q.v.), a wealthy widow.

ALLWORTH, TOM. In Massinger's *A New Way to Pay Old Debts*, the stepson of Lady Allworth, and lover of Margaret Overreach.

ALL'WORTHY, THOMAS. The generous squire in Fielding's *Tom Jones;* foster-father of the hero. He is a philanthropic gentleman, an admirable character, understood to be patterned after Fielding's own benefactor and friend, Ralph Allen (q.v.).

ALMA, ăl′mȧ. A river in the Crimea, rising on the northern woody slope of the Yile, south of the Tchatir-Dagh. It flows at first in a northerly direction, then turns to the west, and empties into a small bay on the Black Sea, about 20 miles north of Sebastopol. It is about 46 miles long. The vale of the Alma is renowned for the beauty of its scenery and its many magnificent fruit gardens. On the steep banks of this stream, through the channel of which the British troops waded amidst a shower of bullets, a brilliant victory was won on September 20, 1854, by the armies of Britain, France, and Turkey, under Lord Raglan and Marshal St. Arnaud, over the Russian army, commanded by Prince Mentchikoff. After five hours of stubborn fighting, the Russians were forced to retreat in disorder upon Sebastopol, 17 per cent. of the Russians (numbering 33,000, against 62,000 of the allies) having been killed and wounded. The Turks took no active part in the battle.

AL′MA. A city and county seat of Wabaunsee Co., Kan., 35 miles west of Topeka, on Mill Creek, and on the Atchison, Topeka and Santa Fé and the Chicago, Rock Island and Pacific railroads (Map: Kansas, F 2). It is the centre of an agricultural and stock-raising district, and has good water power and a large flouring mill. Pop., 1890, 1125; 1900, 966.

ALMA. A city in Gratiot Co., Mich., 36 miles west of Saginaw, on the Pere Marquette and the Ann Arbor railroads, and on Pine River (Map: Michigan, J 5). It is the seat of Alma College (Presbyterian), founded 1887, and of the Alma Sanitarium, an institution which has more than local reputation. The most important manufactures are gas-engines, beet sugar, furnaces, cement blocks, flour, asphalt mastic, and lumber products. Alma was settled in 1853 and was incorporated as a city in 1905. The mayor is elected annually, and the council is composed of eight members. The water-works are the property of the municipality. Pop., 1880, 456; 1890, 1655; 1900, 2047; 1904, 3015.

ALMA. A city and county seat of Buffalo Co., Wis., 25 miles northwest of Winona, Minn., on the Mississippi River and on the Chicago, Burlington and Quincy Railroad (Map: Wisconsin, B 4). It is in an agricultural region, is connected by steamboat with ports on the river, and has some manufactures. Pop., 1890, 1428; 1900, 1201; 1905, 1172.

ALMA. In Spenser's *Faerie Queene*, the personification of the human soul, the queen of "Body Castle."

ALMA. A pseudonym of Charlotte Yonge, the novelist.

ALMACK'S, ăl′măks. A suite of assembly rooms in King Street, London, built in 1765. They took their name from that of their builder; or, rather, that assumed by him. It is said he was originally a poor Scottish Highlander named McCall, and that as a preparatory step to rising into importance in London, he inverted the syllables of his patronymic. The name of Almack's is chiefly associated with the balls which were held there for many years under the management of a committee of ladies of high rank. The glory of Almack's belongs to a period earlier than the middle of the nineteenth century, but the name has become synonymous with aristocratic exclusiveness. The London club now known as Brooks's, formerly Almack's, was started by Almack in Pall Mall some time before 1763. Consult: Timbs, *Clubs and Club Life in London* (London, 1873); Walford, *Greater London* (London, 1883-84).

ALMADA, ȧl-mä′dȧ. A town of Portugal, in the province of Estremadura, on the south bank of the Tagus, opposite Lisbon (Map: Portugal, A 3). It is picturesquely built at the foot of a height, on the summit of which is a strong castle. It is a great wine depot, and has long been celebrated for its figs. Near it is the gold mine of Adissa. Pop., 1900, 7913.

ALMA DAGH, äl′mä däɢ′. The ancient *Amanus*. A branch of the Taurus mountain range in Asia Minor.

ALMADÉN, or **ALMADÉN DEL AZOGUE,** ăl′mȧ-ᴅȧn′ dĕl ȧ-thō′gȧ (Ar., mine of quicksilver). A town in Spain, 50 miles southwest of Ciudad Real, situated between two mountains in the Sierra Morena chain (Map: Spain, C 3). It is a pretty town, with a ruined Moorish castle and a school of mines. It owes all its importance to the quicksilver deposits, belonging to the Spanish government. In the sixteenth century they were leased to the Fuggers of Augsburg. In 1645 they reverted to the crown. During part of the nineteenth century they were worked by the Rothschilds of London. There are five stages or galleries, the lowest being 1150 feet beneath the surface. The mercury is found in many combinations, but about 10,000 tons of ore are annually raised, 10 per cent. of which is pure metal. Employment is given to 4000 miners. Pop., 1900, 7459.

ALMADEN, ăl′mȧ-dĕn′. A township in Santa Clara Co., Cal. Population, 1890, 1932; 1900, 1599 (Map: California, C 3). It is noted for rich deposits of quicksilver, which were discovered at an early date by the Indians, who used the crude cinnabar for paint. The mines began to be worked before 1850, and for several years ranked first among American mines in the amount of production. The greatest amount, 47,194 flasks, was obtained in 1865; since that date there has been a decline.

ALMAGEST, ăl′mȧ-jĕst. The greatest work of Claudius Ptolemæus (see Ptolemy) bore the title Μεγάλη Σύνταξις, *Megalē Syntaxis* (great system). The admirers of Ptolemy changed *μεγάλη*, *megalē*, great, to *μεγίστη*, *megistē*, greatest, and the Arabian translators added the Arabic article *al*, producing *al-majisti*, whence was derived the common mediæval title almagest. The work contains Ptolemy's important contributions to trigonometry and mathematical astronomy.

ALMAGRO, ȧl-mä′grō. A town of New Castile, Spain, in the province of Ciudad Real, 12 miles east-southeast of Ciudad Real (Map: Spain, D 3). It is situated in a high, arid plain, but is very well built, with wide paved streets and a fine square. Brandy, soap, and earthenware are manufactured, and lace-making gives employment to a large number of women in Almagro and the neighboring villages. The surrounding country is celebrated for its beautiful vineyards and olives. The vine of this region yields the well-known red wine Valdepeñas. Pop., 1900, 8015.

ALMAGRO, Diego de (1475-1538). A Spanish adventurer, said to have been a foundling in the Spanish town whose name he bore. He came to America with Pedro Arias de Ávila in 1514 and settled at Darien, whence he removed to Panama in 1519, when that town was founded. In 1524 he formed a partnership with Pizarro for the conquest of a region on the Pacific coast to the south, which was reported to contain gold. The first voyage was a failure. The second voyage, undertaken in 1526, began with a succession of reverses and Pizarro wished to abandon the enterprise, but Almagro persuaded him to continue, and eventually they were rewarded with the wealth of the Incas' Empire. Pizarro secured to himself and his brothers most of the fruits of victory, and deprived Almagro of his fair share of plunder and power. In 1535 Almagro obtained from Charles V. the title of Adelantado, or Governor, of "New Toledo," a territory extending 200 leagues along the coast, beginning at the southern limit of Pizarro's grant. A dispute immediately arose as to the boundary between the two grants, Almagro claiming that Cuzco lay within his territory. He returned from an expedition which he had undertaken, without much success, into the snowy plateau region of the southern Andes, to enforce this claim, and entered Cuzco, asserting that he was its legitimate governor. The Marquis Pizzaro at once dispatched Espinosa to effect, if possible, an amicable settlement; but Almagro was elated by his recent successes and refused to entertain any compromises. Further negotiations led to a personal conference between Pizarro and Almagro, November 13, 1537, which ended in an altercation, and the two old friends parted, for the last time, in very angry mood. Pizarro's forces gradually forced Almagro back toward Cuzco, near which place he made a stand. A furious battle was fought, April 26, 1538. Almagro was captured, and garroted in the following July.

Almagro's son, DIEGO (1520-42), whose mother was an Indian girl of Panama, was at first treated kindly by Pizarro; but he soon came under the influence of some of his father's friends, who had formed a conspiracy to overthrow Pizarro. The marquis was murdered on June 26, 1541; the conspirators proclaimed the lad Almagro, who was about twenty-one years old, Governor of Peru, and then promptly quarreled among themselves. When all but one of the leaders had been murdered or had died from fever and exposure, Almagro took matters into his own hands and ordered the execution of the only remaining man of consequence among them. Meanwhile, Vaca de Castro, who had been sent from Spain by the Government to end the civil war in Peru, arrived and assumed the government. Almagro refused to submit and was attacked by the royal forces, who defeated him in a desperate battle on September 16, 1542. Almagro fled to Cuzco, but was arrested, immediately condemned to death, and executed in the great square of the city.

ALMAIN. An old name for Germany, derived from that of the *Alemanni* (q.v.).

ALMALEE, ȧl-mä'lē. See ELMALU.

AL'MA MA'TER (Lat. nourishing mother). A name applied to a university or college, and expressing the relation between the institution and the students who have been educated in it. The term is one of affection, and suggests a mutual dependence of university and alumnus one upon the other. The term matriculation (q.v.), applied to entrance into a university, carries the same meaning.

AL-MAMUN, ăl'mȧ-mōōn', ABU ABBAS ABDALLAH (783-833). A caliph of the line of the Abbassides (q.v.), distinguished for his intellectual qualities. He was the son of Harun-al-Rashid. When Harun died, his brother Amin succeeded to the Caliphate; but his treatment of Al-Mamun led to war, and after five years of fighting Amin was slain and Al-Mamun took his place (813). The early part of his reign was disturbed by revolts and heresies; but when affairs settled down he fostered the cultivation of literature and science throughout his Empire, and Bagdad became the seat of academical instruction and the centre of intelligence. He had books translated from old and living languages, founded astronomical observatories, determined the inclination of the ecliptic, had a degree of the meridian measured on the plain of Shinar, and constructed astronomical tables of remarkable accuracy. He paid more respect to science than to orthodoxy, and drew his servants from all countries and all creeds. In 827 he favored the heretical doctrines of the Mutazilites, who asserted the free will of man and denied the finality of the Koran. In the latter years of his reign he was involved in war with the Greek Emperor Theophilus, and revolts broke out in various parts of his Empire. In 833, after quelling a disturbance in Egypt, he marched into Cilicia against the Greeks, but died suddenly near Tarsus, leaving his crown to Mutasim, a younger brother. Al-Mamun was the author of *Inquiries into the Koran*, a tract on *Signs of Prophecy*, and one on *The Rhetoric of the Priests and Panegyrists of the Caliphs*. Consult Muir, *The Caliphate* (London, 1891).

AL'MANAC (Of disputed origin). A book or table containing a calendar of the civil divisions of the year, the times of the various astronomical phenomena, and other useful or entertaining information. Till a comparatively modern date, this additional matter consisted of astrological predictions and other analogous absurdities; it now embraces, in the best almanacs, a wide variety of useful notes and information, chronological, statistical, political, agricultural, etc.

The history of almanacs, like all early history of astronomy, goes back to very ancient times. The Alexandrian Greeks certainly had almanacs, though the time when they first appeared in Europe is not precisely known. The oldest of the copies (manuscript) existing are of the thirteenth and fourteenth centuries; there are specimens in the libraries of the British Museum and of Corpus Christi College, Cambridge. The earliest known printed European almanac was compiled by the celebrated astronomer Purbach, and appeared between the years 1450 and 1461; but the first almanac of importance was that compiled by his pupil, Regiomontanus, for the fifty-seven years from 1475 to 1531, for which he received a munificent donation from Matthias Corvinus, King of Hungary. Bernardo de Granolachs of Barcelona commenced the publication of an almanac in 1487; the printer Engel of Vienna, in 1491; and Stöffler of Tübingen, in 1524. Copies of these are now very rare. In 1533 Rabelais published at Lyons his almanac for that year, and renewed the publication in 1535, 1548, and 1550. The fame and popularity of the astrologer Nostradamus, who prophesied the death of Henry II. of France, gave such an impulse to the publication of predictions, that in 1579 Henry III. of France prohibited the insertion of any political prophecies in almanacs—a prohibition renewed by Louis XIII. in 1628. Before this, in the reign of Charles IX., a royal *ordonnance* required every almanac to be stamped with the approval of the diocesan bishop.

Prophetic almanacs have circulated very largely in France in the rural districts and among the uneducated. The most interesting of these is perhaps the old *Almanach Liégeois*, a venerable remnant of superstition. It was first published at Liège—according to the invariable title-page which takes no note of time—in 1636, by one Matthieu Laensbergh, whose existence, however, at any time seems very problematical. The *Almanach Liégeois* is a most convenient one for those who are unable to read, for by certain symbols attached to certain dates the most unlettered persons can follow its instructions; thus, the rude representation of a vial announces the proper phase of the moon under which a draught of medicine should be taken; a pill-box designates the planet most propitious for pills; a pair of scissors points out the proper period for cutting hair, a lancet for letting blood. Of course, amid innumerable predictions, some may naturally be expected to come to pass. So in 1774 this almanac predicted that in April of that year a royal favorite would play her last part. Madame du Barry took the prediction to herself, and repeatedly exclaimed: "I wish this villainous month of April were over." In May Louis XV. died, and Madame du Barry's last part was really played. The credit of old Matthieu was established more firmly than ever. In 1852, a commission having examined between 7000 and 8000 of the national chapbooks, which included a great number of almanacs, pronounced them so deleterious, that it became necessary forcibly to check their circulation. Although still in vogue amongst the ignorant, their popularity is greatly on the wane.

In England, so far was any restraint from being put upon the publication of prophetic almanacs, or "prognostications," as they were usually called, that royal letters patent gave a monopoly of the trade to the two universities and the Stationers' Company, under whose patronage, and with the *imprimatur* of the Archbishop of Canterbury, such productions as *Moore's Almanac* and *Poor Robin's Almanac* flourished vigorously; although "it would be difficult to find, in so small a compass, an equal quantity of ignorance, profligacy, and imposture as was condensed in these publications." The memory of Partridge, long employed as the prophet of the Stationers' Company, is preserved in the lively diatribe of Swift, writing under the name of Bickerstaff. There is a legal decision on record in the year 1775, in favor of a bookseller named Carnan, abolishing the monopoly of the Stationers' Company. In 1779 Lord North brought in a bill renewing their privileges. After a powerful speech against the measure by Erskine, who exposed the pernicious influence of the productions published under the monopoly, it was rejected. The Stationers' Company, however, still maintained their ground by buying up all rival almanacs; and it was not until the publication, in 1828, of the *British Almanac*, by the Society for the Diffusion of Useful Knowledge, that the eyes of the English public became opened to the irrational and deleterious nature of the commodity which their own indifference or folly, as much as the selfishness of their purveyors, had hitherto maintained in existence.

In Scotland the earliest almanacs seem to have been produced about the beginning of the sixteenth century. Shortly after the beginning of the seventeenth century the almanacs, or "prognostications," published at Aberdeen had begun to acquire a great reputation. About the year 1677 they were sold for a *plack* each; and the annual circulation amounted, on an average, to 50,000 copies. In 1683 appeared a rival publication, under the title of *Edinburgh's True Almanack, or a True Prognostication.* For a long time Scottish almanacs continued, like all others of that age, to contain little besides a calendar, with a list of fairs, and—what constituted the great attraction—predictions of the weather. But something more instructive and comprehensive became requisite, and the *Edinburgh Almanac* seems to have been among the first to respond to this requirement of advancing civilization; for, by various additions, such as a list of Scottish members of parliament, it had, in 1745, been extended from the original 16 pages to 36. In twelve years from that date it had swelled to 72 pages; in 1779 it had reached 252 pages. After 1837 it was published under the title of *Oliver and Boyd's New Edinburgh Almanac*, and extended to above 1000 pages.

Almanacs containing astrological and other predictions are still published in Great Britain; but their influence is extremely limited, even among the most ignorant portion of the community, and their contents are fitted to excite amusement rather than any stronger emotion. In America, the publication of almanacs for popular use is confined very largely to the vendors of proprietary or patent nostrums and medicines. These persons distribute the almanacs gratuitously, judging rightly that they constitute a most excellent advertisement of their wares. This is due principally to the fact that people keep their almanacs at hand throughout the year, and thus the advertisements printed in them are ever present to the public eye. Among the almanacs in America that are sold for a small price, the most important are probably the *Old Farmers'*, issued in New England, and those coming from several great newspaper offices. It is believed that the first common almanac in this country was for 1687, from Bradford's press in Philadelphia. Franklin's *Poor Richard's Almanac*, begun in 1732, was kept up by him about twenty-five years, and was widely known both at home and abroad for its wise and witty sayings. *The American Almanac and Repository of Useful Knowledge* was issued in Boston from 1828 to 1861; a continuation, *The National Almanac*, came out for two years only, 1863 and 1864. Nearly every religious denomination has its special annual, either almanac or year-book; and many trades, professions, and enterprises have similar publications.

There are also important astronomical almanacs. The *Nautical Almanac*, published in England, was projected by Nevil Maskelyne, Astronomer Royal from 1765 to 1811, who urged its value in connection with the use of lunar distances for the determination of longitude. The first edition of this work was published with the authority of Government in 1767. After

Dr. Maskelyne's death it gradually lost its character, and in 1830, in consequence of the numerous complaints made against it, the Government requested the Astronomical Society to pronounce upon the subject. The suggestions of the society were adopted, and in 1834 the first number of the new series appeared, with such additions and improvements as the advanced state of astronomical science rendered necessary. Still older than this almanac is the French *Connaissance des Temps*, commenced in 1679 by Picard, and now published under the authority of the *Bureau des Longitudes*. Its plan is similar to that of the *Nautical Almanac*, but it has contained a larger amount of original memoirs, many of them of great value. Equally celebrated is the Berlin *Astronomisches Jahrbuch*, issued from the Berlin Observatory. In the United States the *American Nautical Almanac* was begun in 1849 by Charles Henry Davis, United States Navy, and the first volume (for 1855) was published in 1853. The publication is issued from the office of the *Nautical Almanac and American Ephemeris*, United States Navy Department, in Washington, and contains tables of the predicted positions of the sun, moon, and planets, and of all the fixed stars used in navigation. It is published three years in advance, for the convenience of navigators bound on long voyages. The *Nautical Almanac or Astronomical Ephemeris* is of the greatest importance to astronomers, as it contains collections of numerical data required in the computation of their celestial observations, which are equally necessary to enable navigators to find their way across the sea by the aid of the sextant.

The preparation and publication of these almanacs, though most important, are so costly, that they are possible only to the great financial resources of governments, and it is largely for this purpose that governmental astronomical observatories are maintained.

Congress in 1849 provided for the publication of such a work, in which "the meridian of the observatory at Washington shall be adopted and used as the American meridian for astronomical purposes, and the meridian of Greenwich shall be adopted for all nautical purposes." This law caused the division of the work into the *American Ephemeris* and *Nautical Almanac*. The first-named part is chiefly for the use of astronomers; the second is adapted to the use of navigators.

ALMANACH DE GOTHA, ȧl'mȧ'nȧ' de gō'tȧ'. See GOTHA, ALMANACH DE.

AL'MANDINE (Fr. *almandine*, from Lat. *alabandina*). The red, transparent, precious variety of Garnet (q.v.), so called from Alabanda, a town in Caria, where it was found. This name is also given to a violet colored variety of Spinel ruby.

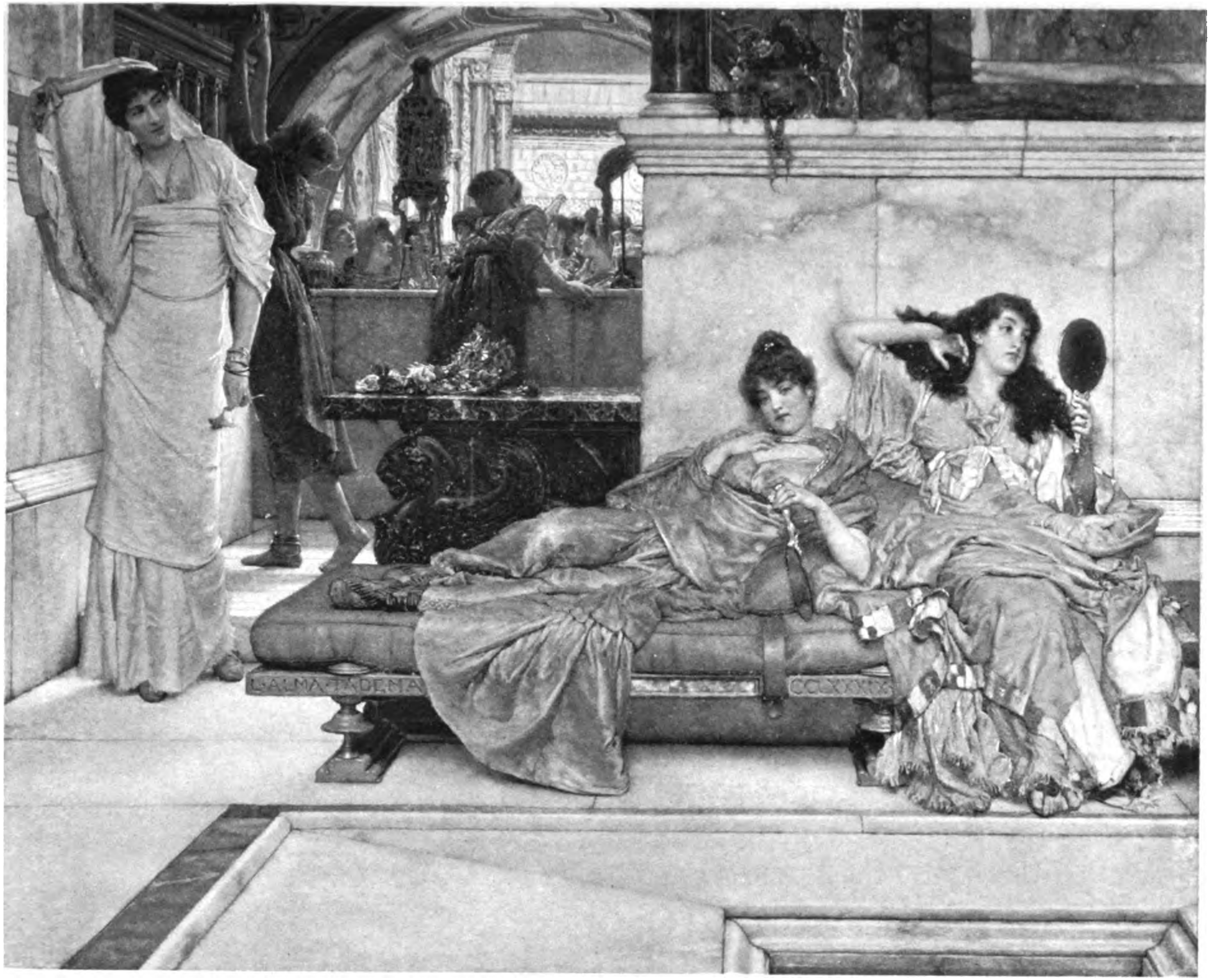
ALMANSA, ȧl-măn'sȧ. A town of Murcia, Spain, in the province of Albacete, 43 miles east by south of Albacete, on the Madrid and Alicante Railway (Map: Spain, E 3). It is two thousand feet above sea level, and stands on a fertile plateau. Almansa carries on manufactures of linen, hempen, and cotton fabrics, the materials of which are supplied from the neighborhood; also of brandy, leather, and soap. Population, 1900, 11,117. Near Almansa the French, under the Duke of Berwick, natural son of James II. of England, gained a victory on April 25, 1707, over an army of Spanish and English troops commanded by Henry de Ruvigny, Earl of Galway. The battle of Almansa was, in its results, one of the most important in the war of the Spanish succession.

AL-MANSUR, ăl'mȧn-sōōr' (Ar., The Victorious), ABU JA'FAR ABDALLAH IBN MOHAMMED (712-775). The second caliph of the house of the Abbassides (754-775). He regulated the finances and the post in the kingdom and patronized learning. One of his great achievements was to found Bagdad. He died during a pilgrimage to Mecca, at the age of sixty-three. See ABBASSIDES.

ALMA-TADEMA, ăl'mȧ tă'dĕ-mȧ, Sir LAURENCE (1836—). A well-known painter, of Dutch origin and Belgian training but English residence for more than half his life. He was born in West Friesland January 8, 1836, and while still a boy showed so decided a vocation for art that he was sent to Antwerp to study under Wappers and for a longer period under Leys, who was making the mediæval and Renaissance periods live again as his pupil was to do with earlier ages. Pictures of Frankish and ancient Egyptian life occupied him between 1860 and 1875, by which time he had begun to devote himself mainly to depicting the life of the Greeks and Romans. Early essays in this style were the "Roman Amateur" and "Pyrrhic Dance," which he sent over to the Royal Academy in 1869. In the following year he went to live in London. His success was recognized by membership in the Academy in 1879 and knighthood in 1899. Among important later pictures are "The Roses of Heliogabalus" (1888), "Spring" (1894), "The Conversion of Paula" (1898), and "Thermæ Antoninianæ" (1899). At the World's Fair of St. Louis (1904) he exhibited the "Coliseum," the "Shrine of Venus" and "Caracalla." Later works are "The Everlasting" (1904), and the "Finding of Moses" (1905). His work is remarkable for its careful archæological research. He is peculiarly successful in defining the textures of marble and bronze. In composition he is scholarly; the various parts or quantities of his scenes are balanced with true artistic instinct. His drawing is good, his coloring faithful, but he is at times charged, and not without reason, with a lack of sentiment. His pictures are solid and competent in execution and have the value of trustworthy records of the past; but they rarely move more than the intellect and the sight. Consult: Zimmern, *L. Alma-Tadema, His Life and Work* (London, 1886); Georg Ebers, *L. Alma-Tadema* (Eng. trans., New York, 1886).

ALMAVIVA, ăl'mȧ-vē'vȧ, COUNT. A character in Beaumarchais's comedies *Le barbier de Séville*, *Le mariage de Figaro*, and *La mère coupable*, appearing successively as a fascinating young nobleman, a disillusioned husband, and an old gallant.

ALMEH, ăl'mē, or **ALMAI** (Ar. *'ālimah*, learned woman, from *'alama*, to know). A class of singing girls in Egypt. To enter the almeh one must have a good voice, know the rules of verse, and be able to improvise couplets adapted to circumstances. They are in demand at all entertainments and festivals, and at funerals as hired mourners. They are distinct from the *ghawāzī*, or dancing girls, who are of a lower order and perform in the streets.



LAURENCE ALMA-TADEMA
AT THE SHRINE OF VENUS

ALMEIDA, ȧl-mā'ē-dȧ. Formerly one of the chief strongholds of Portugal, situated on the River Coa, on the Spanish frontier, in the province of Beira (Map: Portugal, B 2). In 1762 it was captured by the Spaniards, who soon afterward surrendered it. In their retreat from Portugal, 1811, the French, under General Brenier, destroyed a great portion of the fortifications of Almeida, which, however, were speedily repaired by the English. Pop., 1900, 2312.

ALMEIDA. A town situated on the east coast of Brazil, in the State of Espirito Santo, near the mouth of the Reis Magos River, 20 miles north of Victoria. It was founded in 1580. Pop., 4000.

ALMEIDA, Francisco de (1450?-1510). A Portuguese warrior and empire builder. He was born in the middle of the fifteenth century. For his services against the Moors he was made, in 1505, viceroy of the Portuguese possessions in the East Indies. At Cannanore, Cochin, and Quilon, and in Ceylon and Sumatra he either built fortresses to protect the Portuguese factories or founded new trading posts. His attempt to establish the supremacy of Portugal in the Indian seas brought him into conflict with the Venetians and the Egyptians. In a great battle fought between Lorenzo de Almeida, son of Francisco, and a combined Venetian and Egyptian fleet, in the harbor of Chaul, in 1507, young Lorenzo fell. To avenge his death, Francisco sacked the ports of Goa and Dabul, and refusing to acknowledge Albuquerque, who had been sent out to supersede him, destroyed the Egyptian fleet at Diu in 1508. Then he resigned his command and sailed for home, but perished in a skirmish with African savages near the Cape of Good Hope.

ALMEIDA-GARRETT, ȧl-mā'ē-dȧ-gär-rĕt' João Baptista de Silva Leitão, Viscount de (1799-1854). A distinguished Portuguese statesman and author, leader of the romantic movement in his country, and its most important poet of the nineteenth century. He was born at Oporto and died at Lisbon. After a boyhood spent in the Azores, under the tutelage of a highly gifted uncle, Bishop of Angra, he attended the University of Coimbra, and there imbibed the revolutionary ideas which led him to participate in the revolt of 1820, and three years later resulted in his expatriation. Hitherto, his writings, such as the dramas *Merope* and *Catão*, and the didactic poem on painting, *O Retrato de Venus*, reflected the spirit of French classicism and the native "Arcadian" school. In England and France, however, he came under the influence of Scott and the French romanticists, and this influence is reflected in his epic, *Camões* (1825), the burden of which is the poet's longing for his home; and in his equally well known *Dona Branca* (1826), a long poem, half epic, half lyric, and aimed especially against monastic life. He returned to Portugal in 1826, and suffered a brief imprisonment owing to some political articles. Two years later he was again forced to seek safety in exile; but when, in 1832, Dom Pedro returned from Brazil for the purpose of contesting the throne with his brother, Dom Miguel, Almeida-Garrett joined his forces, and after the victory of 1833 was rewarded with a place in the cabinet as minister of the interior. His life henceforth was one of remarkable activity. As a member of the national Cortes, he showed himself an uncompromising supporter of democratic principles, and instituted many reforms. He interested himself especially in the founding of a national theatre and a conservatory of dramatic art, and wrote a long series of prose dramas, the central figure in each case being some typical national character, such as *Auto de Gil Vicente* (1838), *D. Filippa de Vilhena* (1840), and *Frei Luiz de Sousa* (1844). One of his most important contributions to literature is his *Romanceiro* (1851-53), a collection of thirty-two early Portuguese ballads and romances, the text of which he freely restored and emended. His last work is a poem, *Folhas cahidas* ("Fallen Leaves"), a dramatic record of a love that came in the autumn of life, which for pathos and emotional power is hardly equaled in Portuguese literature. An edition of his collected works appeared after his death (Lisbon, 1854-77). The best biography is that of Gomes de Amorim, *Garrett, Memorias biographicas*, 3 volumes (Lisbon, 1881-88).

ALMELO, ăl'mȧ-lō'. A town in the Netherlands, 19 miles by rail northeast of Deventer (Map: Netherlands, E 2). The town possesses a church with the family vault of the Von Rechteren, whose fine castle is also here, and manufactures linen and cotton goods. Pop., 1889, 8354; 1900, 10,018.

ALMERIA, ăl'mȧ-rē'ȧ (Ar. The Conspicuous). The capital of the province of Almeria in Spain, 60 miles southeast of Granada. Almeria is the seat of a bishop (Map: Spain, D 4). It stands at the head of Almeria Bay, at the mouth of the river of the same name; behind it rises a lofty mountain ridge, on which is an ancient Moorish castle. The flat-roofed houses are Oriental in character, and the appearance of the place evidences its antiquity. The Gothic cathedral, begun in 1524, is essentially Spanish in its fortress-like outline and battlemented walls. The church of San Pedro occupies the site of a mosque. There are a normal school, several monasteries, and some ruined castles in the town, but no signs of much intellectual interest or activity. There are manufactures of sugar, white lead, macaroni, etc., but the most important commercial interest in Almeria is its exportation of fruit, grapes, oranges, almonds, pomegranates, etc., and of iron ore. It is a winter resort for invalids, as its climate rivals that of Nice. Population, 1900, 47,326. Almeria is one of the most ancient cities of Spain, and was founded by the Phœnicians. The Romans called it Unci, and Magnus Pontus, the great harbor. It flourished under the Moors, when, as the proverb says, "Granada was no more than its farm." When it passed into Christian hands (1489) its prosperity languished, and only within recent years have railway facilities brought back something of its former activity.

ALMERIA. In Congreve's *Mourning Bride* (q.v.), the heroine, bride of Prince Alphonso, whom she mourns until his unexpected return. Her rôle is famous for the lines, "Music hath charms," etc.

AL'MERI'CIANS. The followers of Amalric of Bène (q.v.).

ALMIQUI, ȧl-mē'kē (native name). A Cuban insectivore. See Agouta; and plate of Cavies accompanying article Cavy.

ALMISSA, äl-mē′sä. A port of the Austrian crownland of Dalmatia, 14 miles southeast of Spalato, at the mouth of the Cetina. Almissa is famous as the rendezvous of the pirates once infesting the Adriatic. Pop. (commune), 1890, 13,200; 1900, 15,100.

ALMODÓVAR DEL CAMPO, ăl′mô-ᴅō′vär dĕl kăm′pô. A town of New Castile, Spain, in the province of Ciudad Real, 22 miles southwest of Ciudad Real (Map: Spain, C 3). It stands on the summit of a ridge, near the Vega, a branch of the Guadiana. The streets are tolerably clean but ill paved. There are ruins of an ancient castle. The inhabitants are chiefly employed in agriculture, and the only manufactures are domestic. Pop., 1900, 11,615.

ALMOHADES, ăl′mô-hädz (Ar. *Al-Muwahhidūn*, "who proclaim the Unity of God"). The name of a dynasty that ruled in northwestern Africa and Spain during the twelfth and thirteenth centuries. In the reign of Ali, second of the Almoravides (q.v.), a religious teacher, Mohammed ibn Allah, calling himself *El Mahdi* (the guided), founded the sect of the Almohades in Africa. They were opposed to the realistic anthropomorphism of orthodox Islam. Their leader exercised great influence over the Arabs and Berbers throughout Northern Africa. Mohammed imposed on his disciples new ceremonies, and composed for their benefit a special treatise entitled *On the Unity of God*. Mohammed found a successor in Abd-al-Mumin, under whom the Almohades rose to great power. They extended their conquests into Spain in 1146, subjugating Andalusia, Valencia, and a part of Aragon, and Portugal as far as the Tagus. Under Yusuf and Yakub-al-Mansur (see Abu Yusuf Yakub), the dynasty of Almohades continued to flourish in great splendor. But in 1212 they were completely defeated by Christians in the battle of Navas de Tolosa, the result of which was a rapid collapse of their power in Spain. The power of the Almohades in Spain terminated in 1257 and in Africa in 1269. Consult: Freeman, *History and Conquests of the Saracens* (Oxford, 1856); Coppée, *Conquest of Spain by the Arab-Moors* (Boston, 1881); Fagnan, "Histoire des Almohades," in *La Revue Africaine* (Algiers, 1892). See Abd-al-Mumin.

AL-MOKANNA, ăl′mô-kăn′nä, or **MOKENNA.** See Mohammedan Sects.

ALMON, ăl′mon, John (1737-1805). An English journalist and bookseller, born in Liverpool. He attended school for a short time at Warrington, was apprenticed to a printer and bookseller, and in 1759 settled in London as a journeyman printer. He soon took to pamphleteering, became a member of the staff of *The London Gazetteer*, and by a pamphlet entitled *A Review of Mr. Pitt's Administration* won the favor of Burke and others of the opposition party at the time of Pitt's resignation (1761). He then became a publisher and bookseller on his own account, and was patronized largely by the members of the opposition. He was a close friend and ardent supporter of John Wilkes (q.v.), and in 1870 was fined for selling a paper containing one of the letters of Junius. In 1784 he became proprietor and editor of the *General Advertiser*, but two years later was driven by a libel trial to relinquish this undertaking. He rendered an important service to students of American history by publishing *The Remembrancer*, a monthly collection of contemporary documents bearing on the Revolutionary War, especially of such documents "as serve to display the injustice of the design and the folly of the councils of Great Britain." He also published a valuable *Collection of all the Treaties of Peace, Alliance, and Commerce between Great Britain and Other Powers from 1688 to 1771; Biographical, Literary, and Political Anecdotes* (1797); and *Correspondence of John Wilkes, with a Memoir of his Life* (1805).

ALMONACID DE TOLEDO, ăl′mô-nä-thēᴅ′ dä tô-lā′ᴅô. A little town of Spain in the province of Toledo, connected with Toledo by rail. It contains an old Moorish castle, and is famous chiefly as the place of a battle between Spanish and French forces on August 11, 1809, in which the Spanish forces, numbering about 30,000, were defeated. Pop., 1900, 1574.

ALMOND, ä′mŭnd (Lat. *amygdala*, Gk. *ἀμυγδάλη*, *amygdalē*), *Amygdalus*. A genus of the natural order Rosaceæ, consisting of trees and shrubs. The almond tree (*Amygdalus communis*) grows from twenty to thirty feet high, closely resembles the peach in general appearance and bloom, and furnishes the almond nuts of commerce. It is native to the Mediterranean basin and southwestern Asia, and has been in cultivation from remote times. The fruit is a drupe with a thin, hard covering, which splits open when ripe. Almonds are of two kinds—bitter and sweet. The bitter almond is cultivated to a limited extent in Mediterranean countries, and the nuts are used in the manufacture of flavoring extracts and of prussic acid. The sweet, or edible, almond is grown on a commercial scale in the south of Europe, in California, and in some other countries of similar climate. The nuts contain a large quantity of a bland, fixed oil; they have an agreeable flavor, and are used for desserts, in confectionery, and medicinally in an emulsion which forms a pleasant, cooling, diluent drink. There are two classes of sweet almonds—the hard shell and the soft shell almond. The latter only is important commercially. Of foreign varieties, the long almond of Malaga, known as the Jordan almond, and the broad almond of Valencia, are most valued in the trade. In California, success in almond-growing came only with the improvement of selected seedlings of local origin. Ne Plus Ultra, Nonpareil, IXL, and Languedoc are the best-known of these. In 1905 California produced 10,000,000 pounds of nuts. In addition to the home production, the United States imports, annually, about a million dollars' worth of nuts. In Syria and northern Africa, almonds are grown on dry and stony soils. They are believed to withstand drought better than any other fruit. In California, good-paying crops are secured only on fertile, well-drained soils, preferably warm loams; and in the arid regions water for irrigation must be abundant.

The almond is propagated mainly by budding on seedling bitter almond stocks. Trees come into bearing in from two to four years from budding, and reach mature fruitage in from seven to ten years. On strong land the trees are set at least twenty-four feet apart each way. The tree is shaped during the first three years' growth, after which little pruning is required. Varieties should be mixed in orchard planting, to insure cross-pollination.

The almond is also widely grown as an ornamental in localities where it seldom if ever produces fruit. It is a favorite flowering shrub in England, northern Europe, and parts of the eastern and southern United States. It is one of the earliest fruits to bloom. The peach-like blossoms appear before the leaves.

The dwarf almond (*Amygdalus nana*) is a low shrub, seldom more than two or three feet in height. It is common in Southern Russia, and is frequently planted as an ornament. Another species (*Amygdalus andersonii*) is found among the hills of southern California, about the Colorado desert. It is a bushy shrub, and the fruit is a small, velvety drupe, little more than half an inch long. Other species not well known but similar to these are found in the east. Fossil forms of the almond occur in the Miocene Tertiary beds of Oeningen, Germany. See Plate of Acanthus.

ALMOND DISEASE. The principle almond disease is that known as leaf-blight. It is caused by the fungus Cercospora circumcissa, which attacks the leaves and twigs, and often defoliates the trees by midsummer. Upon the leaves small distinct yellow spots are formed, from which the leaf tissue falls, leaving the leaf appearing as though pierced by numerous shot. The disease may be prevented by spraying the trees before blooming, and about twice after blooming, with the ammoniacal copper carbonate solution. (See Fungicide.) The second spraying should be applied when the trees are in full leaf, and the third two to four weeks later.

ALMONDE, ȧl-mōn′dȧ, Philippus van (1646-1711). A Dutch vice-admiral, who served under De Ruyter in the fights of 1676, and after the admiral's death commanded the Dutch Mediterranean fleet. He was with Tromp in subduing the naval power of Sweden in 1677. He commanded in 1688 the fleet which conducted William III. to England, and four years afterward gained fame by his defeat of the French at La Hogue. In 1702, with the English admiral, Sir George Rooke, he commanded the allies which destroyed the Spanish fleet in the Bay of Vigo.

ALMONDS, ä′mŭndz, Expressed Oil of. A fixed oil expressed from bitter or sweet almonds, and sometimes used in medicine. It has a pale yellow color, and a mild, rather agreeable taste. It consists largely of olein.

ALMONDS, Volatile Oil of, better known as Benzaldehyde or Oil of Bitter Almonds, C_6H_5CHO. The cake which is left after the expression of the fixed oil from bitter almonds contains, among other matters, two substances called, respectively, amygdalin, and emulsin or synaptase. When the cake is bruised and made into a paste with water, the synaptase acts as a ferment upon the amygdalin, splitting it up into the volatile oil of almonds, hydrocyanic (prussic) acid, and grape-sugar. The oil is not originally present in the bitter almonds; in fact, the latter do not contain a trace of the oil ready formed, so that the oil is purely the product of the fermentation of amygdalin. This action takes place very rapidly, and is complete in twenty-four hours. The paste having been placed in a retort, heat is very cautiously applied, to prevent the lumping and frothing to which the almond infusion is liable. In the distillation, the hydrocyanic acid and the volatile oil unite in an unstable compound which passes over into the receiver, along with much water. The crude oil thus obtained decomposes gradually, the prussic acid being set free, and on this account it is very poisonous, many fatal cases having occurred from its willful, accidental, or careless use. The crude oil may be purified and freed from prussic acid by means of ferrous chloride and lime. The volatile oil (C_6H_5CHO) is the aldehyde of benzoic acid (C_6H_5COOH), into which substance it gradually changes when exposed to the air in a moist state. It is colorless, has an agreeable odor, and an acrid, bitter taste. It is soluble in water to the extent of 1 part in 300 parts of water, but mixes in all proportions with alcohol and ether. It is a highly refractive liquid, of specific gravity 1.05 at 15° C.; it boils at 179° C. At present it is usually prepared by boiling benzyl chloride with an aqueous solution of lead nitrate. The crude product thus obtained is shaken with a solution of acid sodium sulphite, which forms a crystalline compound with benzaldehyde, while the impurities remain in solution. Pure benzaldehyde is obtained from the crystalline compound by the action of dilute acids. The oil is used by confectioners and perfumers, and also in the manufacture of various dyes, etc.

ALMONER, ăl′mŭn-ĕr (O. F. *almosne*, alms, from Lat. *elcemosyna*, Gk. ἐλεημοσύνη, *eleēmosynē*, mercy, alms). The name given originally to a member of a religious order who distributed the money and other things set apart for alms, which by canonical law was to amount to at least a tenth of the revenues of the establishment. Afterwards ecclesiastics also received this name who were appointed by princes to the same office in their households. The Grand Almoner of France was one of the principal officers of the court and of the kingdom, usually a cardinal, and, in right of his office, commander of all the orders. Queens, princes, and princesses had also their almoners, and bishops were usually appointed to this office. In England, the office of Hereditary Grand Almoner is now a sinecure, his only duty being to distribute the coronation medals among the assembled spectators. The Lord High Almoner, usually a bishop, distributes twice a year the sovereign's bounty, which consists in giving a silver penny each to as many poor persons as the sovereign is years of age.

AL′MONTE. A town in Lanark County, Ontario, Canada, 35 miles southwest of Ottawa, on the Canadian Pacific Railway (Map: Ontario, G 2). It manufactures woolen goods, knit goods, and machinery. Almonte was settled in 1830 and was incorporated as a town in 1881. The government is vested in a mayor, elected annually, and a council. Population in 1901, 3023.

ALMONTE, ȧl-mōn′tȧ, Don Juan Nepomuceno (1803-69). A Mexican general and diplomat. He was the reputed son of Morelos (q.v.), the patriot priest. As a mere child he took part in the war of liberation, and in 1815 was sent to the United States to be educated. His diplomatic career began at an early age, and he had filled responsible positions in London and South America before he joined the staff of Santa Anna in 1836, in which year he was made prisoner at San Jacinto. Under Bustamante he was minister of war, and from 1841 to 1846 was minister to the United States, retiring when the annexation of Texas had become a certainty. In 1853 he was again minister to the United States; in 1857 he was minister to France; he had been twice an unsuccessful candidate for the presidency, and party spirit led him to participate in the French invasion of Mexico and the election of Maximilian. Almonte was proclaimed dictator of Mexico in 1862, but was distrusted by all parties, and was removed the same year. The next year he was president of a junta styled the "Regency of the Mexican Empire." In 1864 Maximilian made him regent of the realm and Grand Marshal, and in 1866 he was sent as minister to Paris, where he died.

ALMORA, ȧl-mō′rȧ. The capital of the Kumaun division, North-Western Provinces, British India. It is situated on the crest of a mountain ridge, 5337 feet above the sea, and on the head waters of the Kosila, a branch of the Ramgunga, 87 miles north of Bareilly. It gives its name to a district, has a cantonment for two battalions of Ghurkas, and is a health resort for invalids and consumptives. Pop., 7500.

ALMORAVIDES, ăl-mō′rȧ-vīdz (Ar. *al-Murābiṭūn*, "pickets who have hobbled their horses on the enemies' frontier.") The Christian successes in Spain and the weakness of the Moslem powers in the Mediterranean in the eleventh century excited a Mohammedan revival among the Berbers of Northern Africa. The holy war was preached by Abdallah ibn Tashfin, of the Lamtuna tribe. Together with the Masmuda, and led by Abu Bekr and his second cousin, Yusuf ibn Tashfin, they quickly spread over a part of Algeria and Morocco, founding the city of that name. Called in 1086 to Spain by the Abadides to crush the power of the Aragonese, and especially of the Cid, Yusuf defeated the Spaniards at Sacralias (October 23), but returned to Africa, leaving 3000 Berbers in Spain. In 1090 he was again called over (by the King of Seville), and conquered the whole of Moorish Spain, except Toledo and Saragossa. By 1147 the power of the Almoravides in Northern Africa and Spain was overthrown by the Almohades (q.v.). Their name is preserved in the Maravedi (a coin) and the Marabouts (devotees).

ALMQVIST, älm′kvĭst, Karl Jonas Ludwig (1793-1866). A Swedish writer of unusual versatility but very unstable genius. He was born at Stockholm. At twenty, he left a good post in the civil service and founded a sort of Brook Farm in the forests of Vermland, where the "come-outers" lived under turf, wore homespun, and ate porridge. The experiment failed, and Almqvist resorted to school-teaching and the composition of text-books, at Stockholm, until the publication of a group of romances under the title, *The Book of the Thorn Rose* (begun in 1832), brought him sudden fame. This work shows great power of language and richness of color; and the dramas which followed, though erratic in plan, are masterly in dialogue and of great tragic force. Almqvist now gave himself wholly to literature and published a great number of books and pamphlets on history, religion, ethics, æsthetics, and pedagogy; as well as lyrics, dramas, and novels, chiefly socialistic in tone, and often contradictory in teaching. His moral instability apparently led him to crime, for in 1851 he was charged with forgery and murder, and fled from Sweden to America, where he earned a precarious living under an assumed name until 1866, when he returned to Bremen, where he lived under the name of C. Westermann, and where he died, September 26, 1866. The novels and tales on which his literary fame will rest are of the romantic type. The best of the tales are *The Mill at Skällnora*, *Araminta May*, and *Grimstahama's Settlement*. Of the novels, *The Palace* is typically romantic in its poetic humor. A later work, *It's All Right*, is in another key, more like the problem novel of our day, and is a grim picture of the evils of conventional marriage, indicating the degeneracy of his misused genius.

ALMS′HOUSE. The place where the publicly supported poor are cared for, sometimes called the poorhouse, the infirmary, etc., and in England, the workhouse. Wherever indoor relief is provided, the almshouse is the central local institution throughout the United States for the care of the aged and infirm poor, and also for able-bodied poor who are not committed as vagrants to a correctional institution. It is frequently located on a farm, known as the poor-farm, where light work is given the inmates, the results being utilized to contribute toward their support. The census of 1890 gave 73,045 inmates of almshouses in the United States. Consult: A. G. Warner, *American Charities*, chapter vi. (Boston, 1894); Mary V. Clark, "The Almshouse," a good descriptive paper in the *Twenty-Seventh Annual Report* (1900) of the National Conference of Charities and Correction (Boston, 1901). See Pauperism; Poor Laws.

ALMUCANTAR, ăl′mû-kăn′tẽr (Ar. *al-mukanṭarāt*, pl. of *al-mukanṭar*, sun-dial). In astronomy, a small circle of the celestial sphere parallel to the horizon. The word had fallen rather into disuse among astronomers, but has been used of late years as a name for an instrument invented by Chandler. The instrument consists of a telescope supported on a metal float placed in a basin of mercury. This arrangement assures the perfect horizontality of the float, and the telescope can be used to observe heavenly bodies situated at exactly equal latitudes in the celestial hemisphere. Astronomical investigations of considerable importance have been carried out by the use of the almucantar.

AL′MY, John Jay (1814-95). An American naval officer. He was born in Rhode Island, and entered the navy as a midshipman in 1829. He engaged in the suppression of the African slave trade in 1843-45, and took part in the capture of Vera Cruz and Tuspan in the Mexican War. He was in the blockade service during the Civil War, and ended his career as commander of the Pacific squadron. He became a rear-admiral in 1873, and was retired in 1877.

ALNASCH′AR. In the *Arabian Nights*, the barber's fifth brother, proverbial as a dreamer. Having put his money into a stock of glassware with which to engage in trade, he falls to imagining what he will do with the wealth he is to gain from it, and inadvertently kicking over the basket, smashes all his wares. The name was humorously applied to S. T. Coleridge from his having dreamed the fragment of *Kubla Kahn*, which he wrote after waking.

ALNUS, ăl′nŭs. See Alder.

ALNWICK, ăn′ĭk. The capital of the county of Northumberland, England, on the Alne, about 32 miles north of Newcastle (Map: England, E 1). The streets are broad, well paved, and well lighted; the houses modern, built of stone, and in some instances handsome. A large market-place occupies the centre of the town. Alnwick was at an early period a fortified town, and some fragments of the ancient walls even yet remain. Alnwick Castle, the residence of the dukes of Northumberland, stands at the north entrance of the town, and is considered one of the most magnificent baronial structures in England. During the Middle Ages it was a bulwark against the invasions of the Scots, who thrice besieged it. Population, including Canongate, in 1891, about 6700; 1901, 6700. Consult: F. G. Halleck, *Alnwick Castle, and Other Poems* (New York, 1836); C. H. Hartshorne, *Alnwick, etc.* (London, 1860).

ALO′ADÆ, or **ALO′IDÆ** (Gk. ʼΑλωάδαι, *Alōadai*, or ʼΑλωεῖδαι, *Alōeidai*), Otus and Ephialtes. The sons of Aloeus, or of Poseidon, and Iphimedea, wife of Aloeus. They were celebrated for their great size and extraordinary strength. Every year they grew an ell in breadth and a fathom in height, and at the end of nine years were thirty-six feet broad and fifty-four feet high. They are fabled to have chained the god Ares, and to have kept him in a bronze cask for thirteen months. They also threatened the Olympian gods with war, and would have piled Pelion and Ossa on Olympus had they not been destroyed by Apollo before their beards were grown. It is further said that they fell in love, the one with Hera and the other with Artemis; but Artemis appearing to them in the form of a hind and running between them, they shot at the supposed animal and killed each other. They were worshiped as heroes in some places.

COMMON ALOES.

AL′OE, *Lat. pron.* ăl′ō-ē; *Engl. pron.* ăl′ō (Gk. ἀλόη, *aloē*). A genus of plants belonging to the natural order Liliaceæ. The species are numerous, natives of warm countries, especially of the southern parts of Africa. About 50 miles from Cape Town is a mountainous tract completely covered with aloes, and the hills on the west side of Socotra exhibit them in similar profusion. The species vary in height from a few inches to 30 feet. They have permanent succulent leaves. The negroes of the west coast of Africa make cords and nets of the fibres of their leaves, and stockings are woven from the fibres of a species found in Jamaica. Aloes are chiefly valuable for their medicinal properties, which are laxative, drastic, emmenagogue, and vermifuge. The well-known drug called Aloes (q.v.) is the inspissated juice of the leaves of several almost tree-like species, and particularly of Aloe socotrina, a native of the island of Socotra; Aloe purpurescens, Aloe spicata, and Aloe arborescens, which principally yield the Cape aloes; Aloe arabica, Aloe linguiformis, Aloe mitriformis, and Aloe vera; which latter, found in the East and West Indies, in Italy, and in some of the islands of the Mediterranean, is the only species which can be reckoned European, although it also is probably an introduced plant. The extract prepared from its leaves is known as Hepatic aloes, or as Barbadoes aloes. The Socotrine or Zanzibar aloes is the product of Aloe Perryi. The bitter principle of aloes has been called aloin. With oxygen aloin forms several compounds that possess acid properties. In the East Indies it is employed as a varnish to prevent the attacks of insects; and has even been applied to bottoms of ships to protect them from marine worms. A beautiful violet color which does not require a mordant to fix it, is obtained from the leaves of the Socotrine aloe. It also affords a fine transparent color for miniature painting. Mohammedan pilgrims suspend an aloe over their doors on their return from Mecca, to signify that they have performed the pilgrimage. The American aloe is a different plant. Numerous species are used as decorative plants. For this purpose they are grown indoors and set out during summer. They may be propagated by seed, suckers, or cuttings. See Agave, and Plate of Acacia.

ALOES, ăl′ōz. A drug of great antiquity, for we find Dioscorides, a writer on materia medica of the first or second century, making mention of aloe as a substance obtained from a plant and possessing cathartic properties. It is obtained from numerous sources, including Bombay, Arabia, Socotra, Madagascar, the Cape of Good Hope, and the West Indies. The drug is the inspissated juice of various species of Aloe (q.v.). All these are characterized more or less by producing large, thick, fleshy leaves, stiff and brittle, pointed, and generally terminating in a strong spine, filled with a mucilaginous pulp internally, and containing in the proper vessels of their exterior portion an intensely bitter juice, which yields the medicinal substance of aloe. It is obtained, sometimes in the form of tears, by incision, spontaneous exudation, and inspissation upon the plant; sometimes by spontaneous evaporation of the juice, which drops or exudes by pressure from the leaves when cut away near the base; sometimes by evaporating the same juice with the aid of heat; and lastly, by evaporating the juice and the decoction of the leaves. Owing to the great difficulty of determining the true botanical source of any given sample, the following names are made use of in commerce to denote the various kinds of aloes found in the market: Socotrine, Clear, Cape, East Indian, Barbadoes, and Caballine aloes. The only varieties officially recognized by the Pharmacopœia of the United States are: (1) Socotrine aloes (*Aloe socotrina*), so called from its supposed source, the island of Socotra, near the mouth of the Arabian Gulf. This is the most esteemed of all the varieties used in medical practice. It is a product of Aloe Perryi, a plant from the east coast of Africa, the island of Socotra, and Arabia. (2) Barbadoes aloes (*Aloe Barbadensis*) is prepared in the West Indies from Aloes vera and other varieties of aloes. Browne's *Natural History of Jamaica* states that the largest and most succulent leaves are placed upright in tubs, that the juice may dribble out. This, evaporated, is sold as Socotrine aloes; but the common aloes is obtained by expressing the juice of the leaves, boiling it with water, evaporating, and pouring it into gourds; whence this kind is often called gourd aloes. All kinds of aloes have a bitter taste. Aloes is in a great measure soluble in water, and more so in hot than cold water. Aloes contains an active principle, aloïn, and a resin. The varieties of aloïn, named barbaloïn, socaloïn, and nataloïn, are obtained respectively from Barbadoes, Socotrine, and Natal aloes. When employed in small doses, aloes exerts a tonic, and in larger doses a cathartic action. It is considered by some authorities to stimulate the liver, increasing the flow of bile. Others hold that it acts chiefly upon the large intestine, whose contractions it stimulates. It also causes congestion of the pelvic organs. Its action upon the bowels is slow, requiring ten to twelve hours. Both taken singly, and also in combination with other cathartics, aloes is perhaps the most important and the most extensively used of vegetable remedies of its class. Aloes is an ingredient of a number of laxative pills mentioned in the United States Pharmacopœia, and is the important constituent in most of the much advertised patent medicines. When given to a nursing woman it is usually believed to purge the child at the breast. For illustration see Acacia.

AL′OES WOOD, also Agila wood, Eagle wood, or Agallochum. The inner part of the trunk of Aquilaria ovata and Aquilaria agallocha, trees native of the tropical parts of Asia, and supposed to be the *aloes* or *lign aloes* of the Bible. They are large spreading trees, with simple alternate leaves. Aloes wood contains a dark-colored, fragrant, resinous substance, and is much prized in the East as a medicine, and for the pleasant odor which it diffuses in burning. The resinous substance is found only in the inner part of the trunk and branches, the younger wood being white, and almost scentless. The trees abound in the eastern part of Asia, especially in Cochin China, the Moluccas, and neighboring islands. Aloes wood is not only much prized in the East as a perfume, but many medicinal virtues are ascribed to it. The ancients ascribed to it similar virtues, and so valued it for these and its fragrance, that Herodotus says it once sold for more than its weight in gold. It was regarded almost as a universal medicine. Its very fragrance was supposed to have a beneficial influence, and it was therefore worn about the person. As it admits of a high polish and exhibits a beautiful graining, precious gems were set in it; and it was cut into fantastic forms and worn in head-dresses, etc. There seems to be allusion to a similar use of it in Psalm xlv. 8, "All thy garments smell of myrrh and aloes and cassia." Or perhaps this merely refers to its being employed to perfume clothing. It was also, from a very early period, much used to perfume the apartments of the great. The fragrance continues undiminished for years. Lign aloes is a corruption of lignum aloes (aloes wood).

ALO′GIANS, or **AL′OGI** (Med. Lat. *alogiani*, *alogi*, from Gk. *ἀ*, *a*, priv. + *λόγος*, *logos*, word, reason). A small and obscure sect of heretics in the second century who opposed the Montanists (q.v.), denying that Christ was the Logos and ascribing the Gospel of St. John and the Apocalypse to the Gnostic Cerinthus.

ALON′ZO THE BRAVE AND THE FAIR IM′OGENE. A ballad by M. G. Lewis (q.v.), known as "Monk" Lewis.

AL′OPE′CIA (Gk. *ἀλώπηξ*, *alōpēx*, a fox, because bald patches are supposed to be common among foxes). A disease which causes a falling off of the hair from any part of the body. See Baldness.

AL′OPECU′RUS. See Meadow Grass.

ÁLORA, ä′lō-rȧ. A town of Andalusia, Spain, in Malaga province, 18 miles northwest of Malaga. It stands on an elevated site near the right bank of the Guadalhorce, at the foot of the Sierra Hocha, and in the midst of a fertile country rich in wine, oil, and various fruits (Map: Spain, C 4). Some of the streets are well built and well paved; some are very steep and irregular. There are some strikingly picturesque ruins of an ancient castle. The inhabitants are mostly employed in agriculture. The medicinal and mineral springs of Alora are highly valued by citizens of Malaga, who resort in large numbers to this place. Pop., 1900, 10,206.

ALOST, ä′lōst (Literally, to the east, from Ger. *Ost*, east, it being near the eastern frontier), or **AALST**, älst. A town in Belgium, the old capital of the province of East Flanders, situated on a tributary of the Scheldt, called the Dender, which is here converted into a canal (Map: Belgium, C 4). It is a walled city with five gates, and has the famous church of St. Martin, an unfinished edifice, in late Gothic, one of the grandest in Belgium, and containing a famous painting by Rubens, "St. Roch Beseeching Our Saviour to Stay the Plague of Alost," and the mausoleum of Thierry Martens, who was born here, and who introduced the art of printing into Belgium in 1475. It has a town hall (about 1200), a college, a hospital, the royal school for 450 sons of military men, an academy of design, etc. Its industries are weaving in silk, wool, and cotton, flax-spinning, lace-making, and it has a thriving trade in hops and grain. Pop., 1900, 30,100; in 1905, 32,163.

ALOY'SIA. See LIPPIA.

ALOYSIUS, SAINT. See GONZAGA.

ALP, älp; **ALB,** älb (Swabian) (Lat. *alpes*, perhaps of Celtic origin; Gael. *alp*, rock, cliff), also called the Rauhe Alb or Swabian Jura. A chain of mountains about 70 miles in length, and from 12 to 15 miles in breadth, extending northeast and southwest, and forming a watershed between the Neckar and the Danube. It lies almost entirely within the kingdom of Würtemberg, but crosses Hohenzollern, and is situated from 50 to 100 miles east of the Black Forest; but unlike the latter region, is clothed with forests of hard wood instead of pine. It forms a table-land intersected by a few narrow, deep valleys. The average height of the system is rather more than 2000 feet. On the north it descends to the Neckar in ridges of rocky cliffs and abrupt pointed headlands, but on the south it gradually slopes away to the level of the valley of the Danube. The scenery is often very picturesque, for the sharp, precipitous crags are frequently crowned with the ruins of the strongholds of some of the famous old German families, such as the Hohenzollerns, Hohenstaufens, etc. The geological formations of the Swabian Alps are limestones of Mesozoic age, which, though regularly stratified, have been folded to a considerable extent. Caverns of a very remarkable character abound. The valleys at the base of the hills are fertile, and produce abundance of wine and fruit, but the high table-land has an extremely poor and barren soil. The word Alp is sometimes applied to the green pasture lands on the slopes of the mountains in Switzerland.

ALPAC'A, or **PA'CO** (Ar. *al*, the + Peruv. *paoa*). One of the four cameloid mammals of the Andean region, known zoölogically as *Lama pacos*. It is smaller than the llama, and more nearly resembles the vicuña, although now considered to have been, like the llama, derived from the guanaco. (See LLAMA.) Its form is very sheep-like, except for the long, erectly carried head; and, although wild ones exist, it is mainly known in great, semi-domesticated flocks kept by the Peruvian mountain Indians for the sake of the wool. These flocks graze on the pastures of the loftiest valleys, almost at the snow-line, which seem to be the natural home of the animal, and where they have formed interesting instincts and habits of vigilance and protection against sudden storms and snowfalls. These flocks are said to be so careful to keep together that it is impossible to separate a full-grown individual, so that none can be truly tamed which is not taken when very young. Once a year the Indians drive their flocks to stone inclosures or huts, and shear the wool, after which the flocks are again turned loose. This custom is prehistoric, and Squier says that many of the shearing huts about Lake Titicaca have stood there since long before the Spanish conquest. The alpaca is known from the equator to Tierra del Fuego, but is most common in Peru and Chile; its flesh is well liked as food, and the animal is occasionally used as a beast of burden. The alpaca's coat consists of a thick growth of woolly hair, varying from black to gray or yellowish, and reaching, when unshorn, a length of some two feet. The annually shorn fleece is about eight inches in length. The fibre is small but strong, elastic, very lustrous and silky, and highly valued for weaving warm and fine cloth. The natives of the Andes have made use of it from time immemorial for their ponchos or blankets, remains of which have been found in the oldest graves of the period of the Incas; but it was not until 1836 that the wool began to be exported to Europe and the manufacture of alpaca shawls, cloth, etc., regularly began. This was due to the sagacity and energy of Sir Titus Salt, whose mills at Saltaire, England, are regarded as the foremost in Great Britain. Now the imports of alpaca wool into Europe and America number many millions of pounds annually; but not all of the so-called alpaca cloth is really manufactured from that wool alone, or even in part. See GUANACO; LLAMA; and VICUÑA, and plate of CAMELS AND LLAMAS.

Attempts have been made to introduce the alpaca into Europe, but not with satisfactory results. The considerable flock formerly existing in the Pyrenees seems to have disappeared. Similarly, the costly trial of acclimatizing them in Australia has failed. An attempt was made in 1821 to introduce the alpaca into the United States; a fund was raised, and in 1857 a cargo of them was shipped to Baltimore; but the result showed that they could not be acclimatized.

ALP-ARSLAN, älp'är-slän' (Strong Lion) (c.1028-72). A Seljuk sultan. He was born in Turkestan about 1028, and succeeded Togrul Beg as ruler of the Seljuk realm in 1063. His first act was to unite the whole of his dominions in one kingdom. He embraced Mohammedanism, and took the surname of Alp-Arslan (Strong Lion), his real name being Muhammad Ghiyath-ud-Din abu Khvajah. The Caliph of Bagdad gave him the title of Adhad-ud-Din (Defender of the Faith), and decreed that prayer might be made in his name. He had an excellent vizier, Nizam-ul-Mulk, who was the founder of all the colleges and academies in the kingdom. From 1064 to 1071 Alp-Arslan pursued the course of his conquests, and ruled from the Tigris to the Oxus. In 1065 and 1068 he invaded Armenia and Georgia, at that time Christian kingdoms. He next proceeded against the Greeks, who, under their brave Emperor, Romanus IV., had thrice driven the Turks beyond the Euphrates. In August, 1071, a bloody battle was fought near the fortress of Malaskerd, between the towns of Van and Erzerum. Alp-Arslan gained the victory. The Greek Emperor was taken prisoner, and obtained his liberty only by the payment of an enormous ransom. In the following year, Alp-Arslan invaded Turkestan, but he perished at Berzem, in Turkestan, by the poniard of Yussuf Kothual, whom he had condemned to death. He was buried at Merv.

ALPE'NA. A city and the county seat of Alpena Co., Mich., 125 miles north of Bay City, on the Detroit and Mackinac Railroad, and on

Thunder Bay (Map: Michigan, K 3). It is situated in a region containing numerous lakes, and is a popular health resort. It has a public library, parks, municipal electric light and water plants. Large quantities of lumber in various products are exported, and there are fisheries, tanneries, and manufactures of cement, excelsior, machinery, etc. Alpena was settled in 1835, incorporated in 1871; its charter, revised in 1897, limits the mayor's term to two years, and provides for a city council of twelve members. Pop., 1890, 11,283; 1900, 11,802; 1904, 12,400.

AL'PENHORN, or **ALP'HORN**. A simple conical, somewhat curved wind-instrument, about three feet long, and made of wooden strips. It has a hard-wood cupped mouthpiece and a bell. The notes are the open harmonics of the tube, the quality of tone being modified by the material, and by the smallness of the bore in relation to the length of the tube. It is used by the Swiss to convey signals. The melody usually played on this instrument is called the *Ranz des Vaches* (q.v.). The alpenhorn is usually represented in the orchestra by the oboe, English horn, or bassoon. See MUSICAL INSTRUMENTS.

ALPES, BASSES. See BASSES-ALPES.

ALPES MARITIMES, ȧlp mȧ'rē'tēm'. A department of France (q.v.), in the extreme southeast, on the shores of the Mediterranean and confines of Italy. It is formed mainly of the territory of Nice, ceded by Italy to France in 1860. The capital is Nice.

AL'PETRA'GIUS. See NUR-ED-DIN EL-BETRUJI.

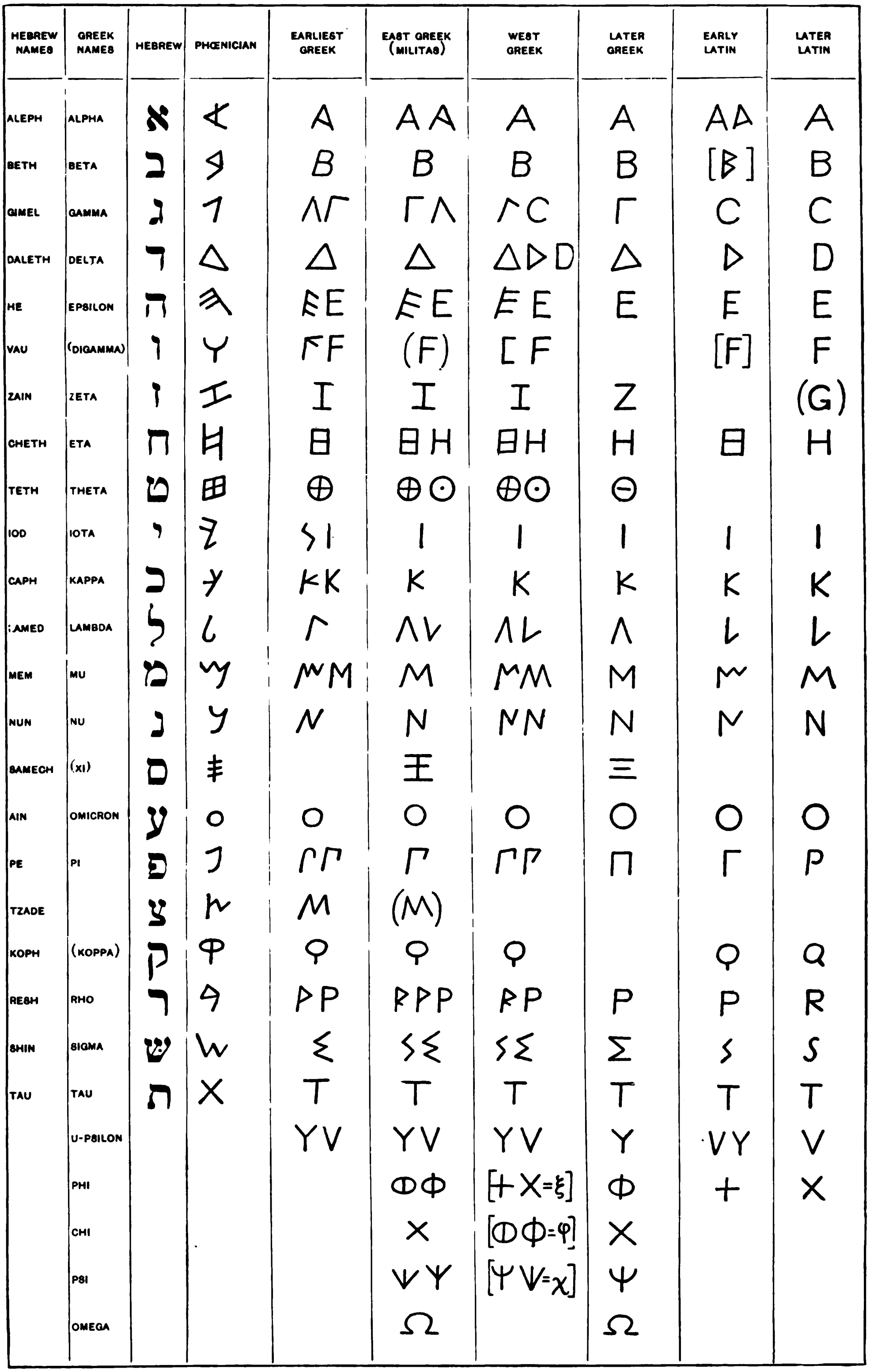
AL'PHA AND OME'GA (*α* [*ἄλφα*] and *ω* [*ὠμέγα*] the first and last letters of the Greek alphabet). A term employed to convey the idea of completeness. The phrase occurs in the New Testament (Revelation i: 8, xxi; 6, xxi: 13) to denote the immeasurable fullness of God and of Jesus Christ; in Revelation i: 8 it is applied to God; in the other passages, to Christ. The Hebrews similarly employed the phrase Aleph and Tau, the first and the last letter of their alphabet, to denote a thing in its entirety. See e.g., Jalkut Rubeni xvii: 4, xlviii: 4, cxxviii: 3. A somewhat similar phrase is found in Isaiah xliv: 6, "I am the first and I am the last," which, applied to God, is intended to express both eternity and universal sway.

AL'PHABET (Late Gk. *ἀλφάβητος*, *alphabētos*, from *ἄλφα*, *alpha* + *βῆτα*, *bēta*, the names of the first two letters of the Greek alphabet; compare the Late Lat. *abecedarium*, the English *A B C*, and Russ. *azbuka*, from *azu* + *buki*, the names of the first two letters). An alphabet may be defined as the series of characters, usually having a fixed order, employed to represent the single sounds of a language. The word is sometimes loosely but improperly employed to denote a series of characters denoting syllables or combinations of elementary sounds. For the various modes employed to represent language, see WRITING; HIEROGLYPHICS; CUNEIFORM INSCRIPTIONS. For the variations in the style of writing at different periods, see PALEOGRAPHY.

The alphabets of modern Europe are derived from the Greek, either directly, as in the case of the Russian, or through the medium of the Latin. The Greek alphabet, in turn, is derived from the Phœnician. This was the view of the Greeks themselves, as appears from the statements of Herodotus and other ancient writers, and from the word, *φοινικήια*, *phoinikēia*, which denotes the letters of the alphabet, and occurs in an inscription of Teos in Asia Minor belonging to the first half of the fifth century B.C. It is true that other traditions were also current, which attributed the invention of the alphabet to such mythical characters as Prometheus, Musæus and Palamedes, while the addition of certain letters was assigned to Epicharmus and Simonides. We are not, however, dependent on the very doubtful authority of tradition for the Phœnician origin of the Greek alphabet. As may easily be seen from the accompanying table, the forms of the earliest Greek letters bear a close resemblance to those of Phœnicia, and the Greek names are for the most part obviously derived from the Semitic. Moreover, the order of the letters in the North Semitic alphabets, as shown by their numerical values and their use in acrostic compositions, is the same as that proved for the Greek by similar evidence, and by the so-called *abecedaria*, or alphabets found on early vases.

The North Semitic alphabets, Phœnician, Hebrew, Aramaic, and their branches, while differing somewhat in the forms of the letters, are obviously of a common origin, and even in the earliest inscriptions show a complete adaptation to the needs of the language. The Himyaritic inscriptions of southern Arabia, and, therefore, the later alphabets of the southern Semites, show a clearly cognate system; but until the age of these early inscriptions is determined, the exact relation of the North and South Semitic alphabets cannot be definitely settled. If Glaser's view, that the Himyaritic monuments belong in part to the second pre-Christian millennium, should prove correct, it might be necessary to regard this as the earliest form of the Semitic alphabet. Even in the present state of our knowledge, it is doubtful whether the southern Semites derived their alphabet from their northern brethren, as there is much that seems to indicate that both branches are indebted to a common source. Whatever be the relation of the Semitic alphabets to one another, the present evidence points to the conclusion that the consistent employment of a small number of signs to denote, not words nor syllables, but the elementary sounds of a language, originated among the Semites, and that through the trading branch of this family, the Phœnicians, this system of writing was carried to the Greeks and the west. Though the attempts to assign meanings to all the Semitic names of the letters has not proved successful, there can be no doubt that at least twelve are significant; e.g., Aleph means ox; Beth, house; Daleth, door; Koph, hollow of the hand; Mem, water; Ain, eye; Resh, head. This leads naturally to the conclusion that the characters were originally representations of these objects, or at least showed some resemblance to them. Inquiry in this direction leads, however, to no satisfactory result as to the origin of the letters, though it may throw light on that part of the Semitic world where the names arose. As both Phœnicians and Hebrews had intimate connections with Egypt, and as the hieroglyphic and hieratic systems had been in use there for centuries before the earliest known Phœnician inscriptions, it was natural to look to the valley of the Nile for the symbols from

ALPHABETS



HEBREW NAMES	GREEK NAMES	HEBREW	PHŒNICIAN	EARLIEST GREEK	EAST GREEK (MILITAS)	WEST GREEK	LATER GREEK	EARLY LATIN	LATER LATIN
ALEPH	ALPHA	א	𐤀	A	A A	A	A	A A	A
BETH	BETA	ב	𐤁	B	B	B	B	[B]	B
GIMEL	GAMMA	ג	𐤂	Λ Γ	Γ Λ	Γ C	Γ	C	C
DALETH	DELTA	ד	𐤃	Δ	Δ	Δ D D	Δ	D	D
HE	EPSILON	ה	𐤄	E E	E E	E E	E	E	E
VAU	(DIGAMMA)	ו	𐤅	F F	(F)	[F		[F]	F
ZAIN	ZETA	ז	𐤆	I	I	I	Z		(G)
CHETH	ETA	ח	𐤇	⊟	⊟ H	⊟ H	H	⊟	H
TETH	THETA	ט	𐤈	⊕	⊕ ⊙	⊕ ⊙	Θ		
IOD	IOTA	י	𐤉	ϟ I	I	I	I	I	I
CAPH	KAPPA	כ	𐤊	K K	K	K	K	K	K
LAMED	LAMBDA	ל	𐤋	Γ	Λ V	Λ L	Λ	L	L
MEM	MU	מ	𐤌	M M	M	M M	M	M	M
NUN	NU	נ	𐤍	N	N	N N	N	N	N
SAMECH	(XI)	ס	𐤎		Ξ		Ξ		
AIN	OMICRON	ע	𐤏	O	O	O	O	O	O
PE	PI	פ	𐤐	Γ Γ	Γ	Γ Γ	Π	Γ	P
TZADE		צ	𐤑	M	(M)				
KOPH	(KOPPA)	ק	𐤒	Ϙ	Ϙ	Ϙ		Ϙ	Q
RESH	RHO	ר	𐤓	P P	P P P	P P	P	P	R
SHIN	SIGMA	ש	𐤔	Σ	Σ Σ	Σ Σ	Σ	S	S
TAU	TAU	ת	𐤕	T	T	T	T	T	T
	U-PSILON			Y V	Y V	Y V	Y	V Y	V
	PHI				Φ Φ	[+ X = ξ]	Φ	+	X
	CHI				X	[Φ Φ = φ]	X		
	PSI				Ψ Ψ	[Ψ Ψ = χ]	Ψ		
	OMEGA				Ω		Ω		

which the letters had been derived. Early attempts to identify the Phœnician letters with Egyptian hieroglyphics led to no satisfactory result; but in 1859 Emmanuel de Rougé read before the French Académie des Inscriptions et Belles Lettres a paper in which he sought to prove that the source of the alphabet was to be found in the hieratic characters, as shown in the Papyrus Prisse, an Egyptian document which cannot be later than the eleventh dynasty, or about 2000 B.C., and may well be much earlier. De Rougé's arguments were first published in detail after his death by his son, in *Mémoire sur l'origine égyptienne de l'alphabet phénicien* (Paris, 1874), and were for a time generally accepted. They were adopted by Canon Isaac Taylor in his book, *The Alphabet* (London, 1883), and have been retained in the second edition (1899).

An altogether new turn to the discussion was given by the discovery of the Tel-el-Amarna tablets containing a series of letters written in Syria about 1379-66 B.C., which showed that at that time the cuneiform characters were used by the Phœnicians and other Semites even for correspondence with the Egyptian court, and that the Babylonian was evidently the language of international relations. Even before this time, Deecke, Peters, and Hommel had attempted to show a connection between the Phœnician alphabet and the cuneiform of Assyria or Babylonia, and recently Delitzsch, *Die Entstehung des ältesten Schriftsystems* (Leipzig, 1897), and Peiser, *Studien zur orientalischen Altertumskunde* (1900), have developed the Babylonian theory, though with differences in detail. This theory, however, labors under one serious difficulty. The early Babylonian characters which are supposed to throw light upon the Phœnician prototypes are at least 1000 and probably 2000 years or more earlier than the earliest Phœnician inscriptions, and differ decidedly from the cuneiform characters in use in Syria within 250 or 300 years of the time when the alphabet must have been developed. A similar objection may be brought against De Rougé's derivation from the earlier hieratic. Neither the Egyptian nor the Babylonian origin can, therefore, be regarded as proved, though neither has been shown to be impossible.

But Babylon and Egypt were not the only great powers of the early civilization of the East. The Hittites (q.v.) had a hieroglyphic system of their own, which might easily have influenced the Phœnicians, though no systematic attempt at direct derivation of the alphabet from this source has yet appeared. The Cypriote Greeks down to the fourth century B.C. made use of a syllabic system which in some of its signs shows a strong resemblance to the Hittite. Even more important is the discovery of at least two early systems of writing on the island of Crete. One of these is distinctly pictorial or hieroglyphic, the other, and later, is linear, and contains a number of forms closely analogous to the Phœnician and early Greek characters. Moreover, similar linear or geometric signs have been found on pottery in tombs of the first dynasty at Abydos in Egypt, and likewise at Kahun (twelfth dynasty) and Gurob; they have also appeared in Palestine at Tel-el-Hesy, and many of them are found in the Carian and Celtiberian alphabets of later times. From these facts Professor W. M. Flinders Petrie has suggested that a signary, or series of signs (whether hieroglyphic, syllabic, or alphabetic is unknown), was in use around the coast of the Mediterranean from a very early date (perhaps 5000 B.C.). These signs increased in number and variety, and from them has been selected the later alphabet. The selection and grouping are due to the Phœnicians, who assigned commercial values to certain characters, and thus transmitted them to the Greeks. The value of this Ægean element in the discussion cannot be fairly estimated until the Cretan linear and hieroglyphic systems are at least partially understood, for as yet none of the values of the signs is known; and although the resemblance in form between the early signs and the late letters is undeniable, the same thing is true of many early Babylonian and Egyptian characters. It is indeed obvious that mere external likeness is insufficient to prove a common origin; there must be sufficient resemblance in sound or meaning to account in some degree for the choice of that particular sign by the borrower to serve as a letter in the new alphabet.

When the Greeks adopted the Phœnician alphabet is uncertain. It can scarcely have been earlier than 1000 B.C., nor later than the eighth century, as it evidently succeeded the Dorian invasion, but preceded the great colonizing movement, since the colonies regularly use the same alphabet as the mother city. While adopting the characters, with their names and order, from the Phœnicians, the Greeks found some changes in values necessary. The Semites did not write the vowels, and the Greeks appropriated for this purpose four of the breathings, which were not needed in the Semitic system of phonetics. For the fifth vowel (u), they very early adopted a differentiation of the spirant (vau), and placed it at the end of the Phœnician series. Among the wealth of sibilants offered, Zain was universally appropriated for the double consonant Zeta (probably dz); as between Samech, Tzade, and Shin there is great diversity of usage among the early local alphabets, and no general agreement among epigraphists as to the exact course of the development. In the Ionian alphabet, which ultimately came into general use, the place of Samech was filled by Xi (x), Tzade was dropped, and Shin used for the simple (s) sound. A history of the numerous local variations in the Greek alphabet lies outside the scope of this article. It is enough to mention the chief varieties, which were influential in the development of borrowed alphabets. The primitive alphabet, omitting Xi and ending with Upsilon, is found in early inscriptions of Thera, Melos, and Crete. To this alphabet were added three supplementary signs, and in the method of this change the Greek alphabets after the seventh century fall into two great groups, the Eastern and Western. The former includes Asia Minor, the islands of the Ægean, and some points on the Greek mainland; the latter includes Eubœa, most of the States of Greece proper, Sicily, and Italy. It is to be noted that the lines of demarkation are not those of the dialects nor of the races, though the Eastern group is largely Ionian, and the Western Dorian. Attica occupies a middle position. The Eastern alphabet adopted Ξ = ξ = x, and added Φ = φ = ph, X = χ = ch, and Ψ = ψ = ps. The Western alphabet shows X = ξ = x, Φ = ph, Ψ = χ = ch, ps was expressed by πσ or φσ, or in some cases by a new sign ∗. The origin of these signs, and especially the curious diversity in their use, still lacks a satisfactory explanation. Among the East Greeks also arose the differentiation of the *e* and *o* sounds, which, after some variations, settled into denoting the short *e* by E, while for the long *e* was chosen the original aspirate (H); O was appropriated for short *o*, and for long *o* a new symbol (Ω) was invented. Vau or Digamma (ϝ) was disused, as the sound had been early lost among the Ionians. In adopting the alphabet, the Greeks seem at first to have adopted also the direction of the Phœnician writing, from right to left, but very early to have become more independent and adopted the form where the lines run alternately from right to left and left to right, like the course of the oxen in ploughing, whence the name *βουστροφηδόν, boustrophēdon.* But the direction was unimportant, and the early inscriptions show many strange variations. It was not until the fifth century that the habit of writing from left to right supplanted the earlier forms.

Through the Greeks the alphabet was brought to Italy, and naturally in the Western form, since Chalcidians of Cumæ seem to have been the intermediaries. Here also developed many local variations; but most of the Italian alphabets preserved throughout their history the original direction of the writing. The Latins, however, probably because of growing intimacy with the Greeks, adopted the later Greek method. The Greek alphabet was not adopted in its entirety. The aspirates (*th*, *ph*, *ch*) were not needed, and Z, though perhaps existing in early times, was soon dropped, and its place later taken by G, a differentiation of C, which seems for a time to have done duty for both the *k* and *g* sounds, as K early fell into disuse, if it did not actually disappear. About the time of Cicero, for the transcription of Greek names, the characters Y (U) and Z were introduced at the end of the alphabet. This Latin alphabet, as spread by the Roman conquests, became the alphabet of the modern European languages, with the exception of Russian, which is derived from the Byzantine Greek of the ninth century A.D., and in its early ecclesiastical form was the invention of the missionary Cyril, who found it necessary to add twelve signs to express the Slavonic sounds. The number was afterward increased to forty-eight, and in the reign of Peter the Great again reduced and the alphabet modified into the present Russian alphabet of thirty-five letters. See RUNES and OGAM for primitive Germanic and Irish writing, and GLAGOLITSA and KIRILLITSA for the Slavic alphabets.

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ALPHAND, ål'fäN', JEAN CHARLES ADOLPHE (1817-91). A French civil engineer. He was born at Grenoble, studied at the École Polytechnique, and was appointed an engineer at Bordeaux. He was appointed chief engineer of the improvements of Paris in 1854, director of works in 1871, and in 1878 director of water supply and drainage. In 1857 he was chief engineer of roads and bridges, and in the Franco-Prussian War was colonel of an engineer corps charged with the task of strengthening the fortifications of the capital. He divides with Baron Haussmann the honor of having reconstructed Paris.

ALPHE'US (Gk. Ἀλφειός, *Alpheios*). The chief river of the Peloponnesus (Morea), rising in the southeast of Arcadia, and flowing west through Elis and past the famous Olympia, into the Ionian Sea. This river is one of the most celebrated in ancient song, and is connected with a beautiful and characteristic Greek legend. The upper course of the Alpheus was of a character likely to affect strongly the imagination of the Greeks. In its passage through Arcadia, a country consisting of cavernous limestone, and abounding in shut-in basins and valleys, it twice disappears under ground and rises again. After these feats it was deemed capable of anything—even of flowing under the sea—and the Greek colonists of Sicily thought they recognized it in their new country. Close on the margin of the sea in the island of Ortygia (the site of Syracuse), was the beautiful and copious fountain of Arethusa, and its fresh water was believed to be that of the Alpheus. As evidence it was asserted that when the river overflowed its banks, the refuse of Olympia polluted the fountain, and that a golden cup, thrown into the Alpheus at Olympia, reappeared in Arethusa. This popular belief was reflected in a favorite story of the later classical times. The river-god Alpheus became enamored of the nymph Arethusa while she was bathing in his stream. To escape him, she prayed to Diana, who changed her into a fountain, and opened up an underground passage for her to Ortygia. The river still pursued, and passing from Greece to Sicily below the sea, without mingling his waters with it, united with his love in the fountain.

ALPHONSE, ål'fôNs' (1220-71). Count of Poitiers and Toulouse, son of Louis VIII. of France. He took part in the Sixth Crusade (1249-50), led by his brother, Louis IX. (St. Louis), with whom he was taken prisoner at Mansurah. He also accompanied King Louis in the Seventh Crusade (1270), against Tunis, where he fell fatally ill. His administration of the affairs of his domains was prudent and just, and made in general toward increased autonomy and centralization.

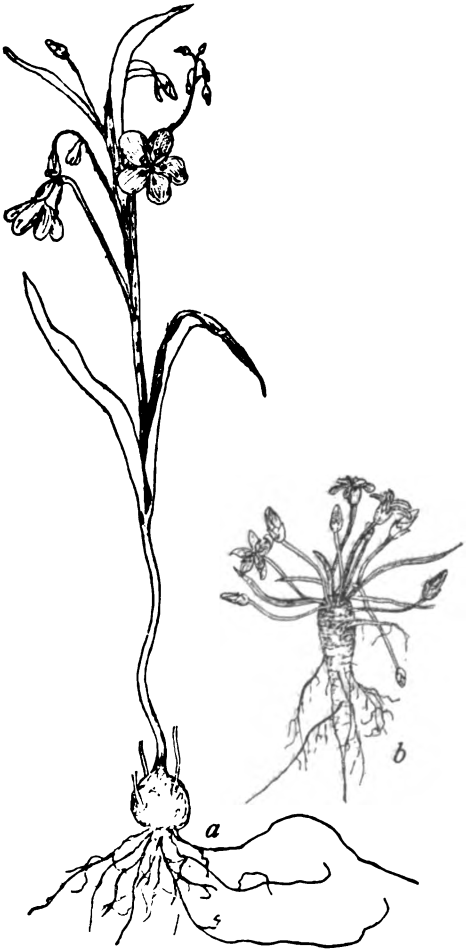
ALPHON'SINE TA'BLES. See ALFONSINE.

ALPHON'SO. See ALFONSO.

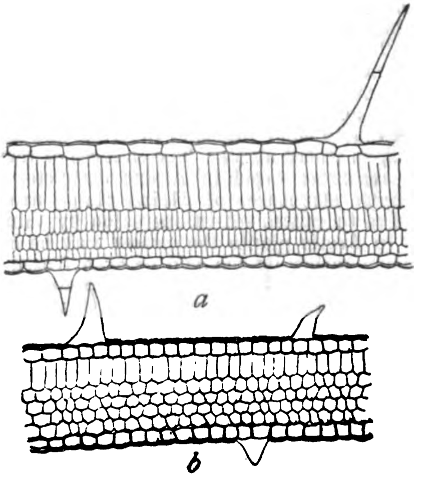
ALPHON'SUS MARIA DI LIGUORI. See LIGUORI.

AL'PINE CLUBS. Societies for the promotion of mountain exploration and adventure. The most noted mountain club is the Alpine Club, of England, organized in 1857. In 1863 it began to publish the *Alpine Journal*. This organization was followed by others in Europe. The clubs have encouraged geographical exploration, not only of European mountains, but of the Himalayas and other Asiatic ranges, the Andes, the New Zealand Alps, etc. There is an extensive Alpine literature, which began in 1859 with the Alpine Club's *Peaks, Passes, and Glaciers*. In the United States there exist the Sierra Club and the Mazamas, on the Pacific coast, and the Appalachian Mountain Club (q.v.).

AL'PINE PLANT. A plant whose natural habitat is in high altitudes. These plants form one of the three great climatic groups of xerophytes (q.v.), and have in general the ordinary xerophytic adaptations. Among the leading peculiarities of Alpine vegetation there may be noted (1) The gnarled and twisted aspect of the shrubs and trees; so characteristic is this habit in the mountain pine of Europe that the tree has been called by the Germans *Krummholz*, i.e., "crooked wood." (2) The vegetation is notably dwarfed. (3) The plant axes are commonly horizontal rather than vertical, and as a result there is a great number of creeping plants. (4) The "cushion (Ger. *Polster*) habit," so common elsewhere in mosses, is found in many seed plants, which sometimes resemble a brain coral in general effect. (5) The rosette habit is frequent. (6) The flowers and roots of Alpine plants, in striking contrast to the stems and leaves, are not reduced; they may even be increased. This combination makes the roots and flowers appear gigantic, and travelers, as a consequence, are always struck with the relatively large floral development. (7) Alpine leaves show decidedly xerophytic structures, many plants having thick-skinned, leathery evergreen leaves, as the pines and rhododendrons, while others have hairy leaves, as the edelweiss. Kerner, *Die Abhängigkeit der Pflanzengestalt von Klima und Boden* (1869), and Bonnier, *Cultures expérimentales dans les hautes altitudes* (1888 to date), have carried on some remarkably interesting experiments to determine the influence that Alpine climates exert upon plants. Lowland plants were taken into Alpine regions and were found to assume structural adaptations similar to those normally found in Alpine plants but not normally found under lowland conditions. In particular, subterranean organs were found to increase in size, while aërial stems became reduced and tended toward horizontality. The leaves became smaller and thicker and often more hairy; sometimes the leaves showed more red coloration. The flowers became relatively, and in some cases absolutely, larger and more highly colored, and blossoming often took place earlier than in the lowlands. Structurally the leaves showed a thicker cuticle and increased development of palisade cells. Bonnier found that these plants increased in Alpine characters year by year, and



Spring beauties (*claytonia*) from the eastern lowlands (a) and Alpine districts of the Rocky Mountains (b). Note that the Alpine form shows great stem reduction, moderate leaf reduction, flowers relatively unchanged, and increased root system.



Cross-section of leaf of Germander (*Teucrium*) from the Alpine regions (a) and the lowlands (b). Note the greatly increased leaf thickness and palisade development in the Alpine leaf. After Bonnier.

that, when taken again to the lowlands, the Alpine features were not lost for a long time. In general, the adaptations of Alpine plants are similar to those of Arctic plants, but it has been noticed that the leaves are thinner and show more differentiation, intercellular spaces are fewer, and palisade cells better developed. Hairy plants are perhaps more characteristic of Alpine than of Arctic regions. The Alpine conditions are peculiar and are chiefly due in the last analysis to the rarefied air. The consequent decrease in pressure has probably a direct effect on vegetation, but experiments have not yet made this clear. In any event, the thin air causes a greatly increased intensity of heat and light by day, and a greatly increased radiation of heat by night. Thus great extremes of temperature are the rule. The rarity of the air also prevents great rainfall. These conditions, together with exposure to wind, work in harmony toward the development of a highly xerophytic flora, as has been previously mentioned, and it is easy to see how none but xerophytes can survive in such a location. The differences between Arctic and Alpine conditions may be summed up thus: Arctic light is more constant, but less intense, and this perhaps accounts for the differences in leaf structure and color intensity in Arctic and Alpine regions, as stated above. The changes of temperature are more rapid in Alpine districts. The xerophytic structures of Alpine plants are perhaps due to causes set in operation by thin air, while in Arctic plants the causes may be set in operation rather by the cold or even frozen soil. See also MOUNTAIN PLANT, and the plate showing ALPINE VEGETATION, accompanying this article.

ALPINI, äl-pē′nē, **PROSPERO** (1553-1617). A Venetian botanist and physician. He anticipated Linnæus in determining the sexual differences of plants, and one of his papers gave Europe the first notice of the coffee shrub. He filled the chair of botany in the University of Padua for many years. His best known work is *De Plantis Ægypti* (Venice, 1592; Padua, 1640). The genus Alpinia is named after him.

ALPIN′IA. See GALANGALE.

ALPS. The word Alp is of Celtic origin, and signifies, according to some authorities, "white," and according to others, "high." Thus the Alps may be simply the White Mountains, or the High Mountains. The name is applied to a mountain system of Southern Europe, which includes most of Switzerland, and extends into France on the west, Austria on the east, Italy on the south, and Germany on the north, and covers altogether an area of some 80,000 to 90,000 square miles (Map: Europe, D 4).

The system rises from the shore of the Mediterranean west of the Gulf of Genoa, and at first trends northward to the west of the plain of Lombardy; then swinging to the east, it stretches with an east and west trend through Switzerland and across the north of Italy into Austria. The total length of the system is upward of 600 miles, and its breadth ranges from about 75 to about 150 miles. It contains hundreds of peaks exceeding 10,000 feet, and its crowning summit, Mont Blanc, has an altitude of 15,781 feet. In the extreme northeast, where the Alpine system reaches the Danube, it is met by a range belonging to the great system of the Carpathian and Sudetic Mountains. On the west the Alps are connected with the Jura Mountains. In the south the Apennines form a great continuation, extending as far south as Sicily. The Cévennes in southeastern France constitute in a measure a connecting link with the Pyrenees. The range of mountains known as the Dinaric Alps, on the borders of Dalmatia and Bosnia, are a connecting link between the Alpine system and the Balkan Mountains. The slopes upon the south, to the plains of Lombardy, are much more abrupt than those on the north to the lower lands of Switzerland and Austria. This broad, complex mountain region is the source of many of the great rivers of Europe. The western slope of that part of the range which trends north from the Mediterranean shore is drained into that sea by the Rhone, while the east slope of this part, together with the southern slope throughout Italy, is drained into the Adriatic mainly by the River Po. The north slope is drained into the North Sea by the Rhine, and into the Black Sea by the Danube, which flows around the eastern end of the mountain system. The head branches of these rivers, aided by the glaciers at their sources, have eroded this mountain mass into a complex of short ranges and ridges, many of which have received distinctive names.

SUBDIVISIONS. The Alps are commonly, but rather arbitrarily, divided into three portions. The Western Alps comprise that portion having a north and south trend, and extending northward to the Great St. Bernard Pass; the Central Alps extend thence eastward to the Brenner Pass, while the Eastern Alps include the remainder. In the Western Alps the ranges and ridges are broken and irregular, while in the other parts of the system the secondary ranges trend more commonly parallel to the axis of the system. The system is still further subdivided into groups or ranges separated from one another more or less completely by stream gorges. The following groups are comprised in the Western Alps: The Maritime Alps, near the Mediterranean coast; the Cottian Alps, stretching from Mont Chambeyron, 11,155 feet, to the Col de Fréjus. It contains several peaks exceeding 12,000 feet in height. West of it is the small group known as Oisans, with Mont Pelvoux, 12,970 feet, and Les Écrins, 13,462 feet, the highest peak of Dauphiné. The Graian Alps are the northernmost group of the Western Alps; here are Grand Paradis, 13,324 feet; Mont Pourri, 12,428 feet; La Grivola, 13,028 feet; the Grands Coulvirs, 12,567 feet; the Grande Sassière, 12,430 feet; and, at the turning point of the range, Mont Blanc, 15,781 feet.

The Central Alps are subdivided into many groups, of which only the principal ones can be mentioned. The Bernese Alps separate the upper valley of the Rhone from the Aar, and comprise many well known peaks, among them the Jungfrau, 13,672 feet; Finsteraarhorn, 14,026 feet; Aletschhorn, 13,720 feet; Mönch, 13,465 feet; Eiger, 13,040 feet; Schreckorn, 13,385 feet, and Wetterhorn, 12,150 feet. This is one of the most rugged groups of the system, containing many peaks exceeding 12,000 feet in height, and having many glaciers, one of which, the Aletsch, is the longest in the Alps. On the opposite side of the Rhone valley is another splendid range, the Pennine Alps, in which, grouped about Zermatt, are the Matterhorn or Mont Cervin, 14,780 (14,705) feet; Weisshorn, 14,803 feet; Grand Combin, 14,164 feet; Lyskamm, 14,889 feet; Mischabel, 14,941 feet; and Monte Rosa, 15,217 feet. The St. Gothard range stands at the sources of the Reuss, Rhine, and Ticino, separated on all sides by comparatively low passes. To the south and east of it, and to the northeast of the Pennine Alps, are the Lepontine Alps, through which from northwest to southeast extends the valley of the Ticino. Between the Aar and Reuss are the Emmenthal Alps, separated from the Alps of Uri on the east by the Brünig Pass. The Tödi chain continues the line of Bernese Alps northeastward, with Tödi, 11,887 feet. The Rhætian Alps stand about the head-waters of the Inn River, and contain many fine peaks, exceeding 11,000 feet in height, while south of them is the splendid Bernina group, with Mont Bernina, 13,294 feet. Still further south, on the south flank of the system and east of Lake Como, are the Alps of Bergamo. East of the Rhætian Alps are the Otzthal and Ortler Alps, with peaks rising above 12,000 feet, the Ortlerspitze being 12,800 feet.

The Eastern Alps are of less height than the other two groups, and are broken into a great number of semi-detached groups and ranges; the North and South Tyrolese, Sarnthal, Dolomite, Venetian, Carnic, and Julian Alps, Hohe Tauern, Niedere Tauern, and the Salzburg, Styrian, and Austrian Limestone Alps. The Eastern Alps culminate in the Gross-Glockner, in the Hohe Tauern, on the borders of Tyrol, Carinthia, and Salzburg, which rises to a height of 12,457 feet, and from which descend glaciers almost rivaling those of the Swiss Alps.

The highest part of the Alpine system, as expressed by the altitude of its summits, is in the western part of the Central Alps, in the Bernese and Pennine groups, and about Mont Blanc. From this region the altitudes diminish eastward and southward. Owing to the broken character of the system, passes are numerous; many of them are comparatively low, and are utilized as routes for roads and railroads. Some of them have been used as routes of travel for many centuries.

PASSES AND ROUTES. The passage of the Western Alps is made by five principal roads: (1) The military road, La Corniche, a coast road at the foot of the Alps from Nice to Genoa, parallel to which a railway now runs. (2) The road over the Col-di-Tenda, between Nice and Cuneo, made in 1778; highest point, 6150 feet. (3) The high road over Mont Genèvre, connecting Provence and Dauphiné with Turin; highest point, 6100 feet. (4) The carriage road made by Napoleon in 1805, over Mont Cenis, connecting Savoy with Piedmont; highest point, 6850 feet. Near this the chain is pierced by the railway tunnel of Mont Cenis. (5) The pass of the Little St. Bernard, connecting Savoy and Piedmont; highest point 7180 feet. The passage of the Central Alps is made by eight principal roads: (1) That of the Great St. Bernard, connecting the valley of the Rhone with Piedmont; highest point, 8120 feet. It was crossed by Napoleon in 1800. (2) The magnificent road over the Simplon, which mountain is pierced by the Simplon railway tunnel at a level below that of the St. Gothard tunnel, was constructed by Napoleon, 1801-06, and connects Valais with the confines of Piedmont and Lombardy; highest point, 6590 feet. (3) The pass of St. Gothard, connecting Lucerne with Lago Maggiore; highest point, 6936 feet. One of the great Alpine railway tunnels is the St. Gothard. (See ST. GOTHARD.) (4) The San Bernardino Pass; highest point, 6770 feet. (5) The Splügen Pass, connecting the sources of the Rhine with the Adda, highest point, 6945 feet. This pass was the one used by the Romans in their intercourse with the countries bordering on the Danube and the Rhine, and also by the German armies on their marches into Italy in the Middle Ages. (6) The Furka Pass, separating the heads of the Rhine and Rhone, and crossed by a wagon road at an altitude of 7992 feet. (7) The Stelvio Pass (Stilfser Joch), on the frontiers of Tyrol and Lombardy, traversed by the most elevated carriage road in Europe; its highest point, 9855 feet. (8) The Brenner Pass known to the Romans, on the road from Innsbruck to Trent and Verona, highest point 4409 feet. It is now crossed by a railway. Besides these great roads, leading south into Italy, there are two which lead north from the valley of the Rhone, and cross the Bernese Alps, over the Grimsel Pass, 7103 feet high, and the Gemmi Pass, 7640 feet high. The roads over the Eastern Alps are much lower and also much more numerous than those in the Middle or Western Alps. The principal are: (1) The road from Venice to Salzburg, crossing the Noric Alps at an elevation of rather more than 5000 feet. (2) The road over the Carnic Alps, which divides into three branches—the first leading to Laibach, the second to the valley of the Isonzo, and the third to the valley of the Tagliamento. (3) The roads from the Danube at Linz to Laibach.

There are four railways crossing the Western and Central Alps: The Mont Cenis, connecting France with Italy; the St. Gothard, connecting Lake Lucerne with Lago Maggiore; the Simplon, from the upper Rhone Valley to Lago Maggiore, and the Brenner, from Munich and Innsbruck to Verona and Venice. The Arlberg railway, which pierces the Alps in the Arlberg Tunnel, is the great highway between Switzerland and Austria. Besides these through lines, there are many extending into the heart of the mountains. From the upper valley of the Aar many lines extend southward into the Bernese, Urner, and Glarner Alps to Interlaken, Lauterbrunnen, and Grindelwald, and to Brienz, Meiringen, Lucerne, and Linthal. A railway passes up the Rhone Valley, with a branch to Zermatt, in the Pennine Alps. On the Italian side several railways penetrate the mountains to considerable distances. The Eastern Alps are crossed by several railway lines, which subdivide and join, sending off many branches within the mountain area. Many of the points affording the grandest views in the Alps are now reached by mountain railways; the Gornegrat Railway, the highest railway in Europe, in the vicinity of the Matterhorn, climbing up to an elevation of 9908 feet. The most extensive panorama to be had from any easily accessible point is that obtained from the summit of the Rigi, a peak near Lucerne, less than 6000 feet high. As a pleasure ground for the lovers of grand scenery and adventurous mountain climbers, the Alps are the most attractive region on the earth. It is a truism that the most valuable of Switzerland's assets is the scenery of the Alps. Not that these are the finest mountains on the face of the globe, but there are no others comparable with them which are so accessible, and in which living and travel are so pleasant and easy. Railways and carriage roads traverse these mountains in all directions. At the best scenic points are excellent hotels, and guides are provided for conducting visitors to all points. Hence every year tens of thousands of travelers visit the Alps from all parts of the civilized world.

GLACIERS. As the Alps rise to heights of 12,000 to nearly 16,000 feet above the sea, in a region of ample rainfall, the precipitation on these mountains is great, and gives rise to extensive glaciers, which originate near the summits and descend to different levels, the longest reaching within four or five thousand feet of sea level, and one of them, the Lower Grindelwald, having its termination at an elevation of only 3550 feet. The principal glaciers are found in the Bernese and Pennine Alps, and the group about Mont Blanc, although numerous smaller ones exist in many other parts of the system. The total number is estimated at 1200, of which 471 are in Switzerland and 462 in Austria, those in the former country being by far the largest, covering an area of 710 square miles; the total area of snow and ice in the Alps is about 1600 square miles. The largest and longest of the Swiss glaciers is the Aletsch, in the Bernese Alps, with a length of 16 miles (area, 50 square miles), and a breadth of ice of more than a mile. In length the Unteraar is next, with a length of 10.4 miles, followed by the Gorner in the Pennine Alps and the Viesch in the Bernese Alps, each of which is 9.4 miles in length. Other well-known glaciers are the Mer de Glace, above the Valley of Chamonix, Miage Glacier, which has its source on Mont Blanc, the Oberaar and the Unteraar, in the Bernese Alps, and the Rhone Glacier in the same group, near the Furka Pass.

Our present knowledge of glaciers, their origin, structure, flow, advance, recession, and the phenomena of erosion, has been mainly derived from a study of these Alpine glaciers. The present glacial system is but the last dying remnant of great ice sheets which once covered both flanks of the mountain system, descending to the plains and valleys on either side. As it shrank, it developed great rivers of ice, which carved mountain gorges and lake basins. The lake scenery of the Alps is unrivaled for beauty, grandeur, and diversity. The largest lakes include Geneva, draining into the River Rhone, Neuchâtel, Bienne, Thun, Brienz, Lucerne, Zug, Zürich, Constance, Como, Lugano, Garda, and Maggiore. In the high mountains are cirques at the heads of all gorges not now occupied by ice, with little lakelets surrounded by frowning semicircular sweeps of cliffs, hanging valleys, and smooth-sided, U-shaped gorges, planed and polished, all bearing mute evidence of their glacial origin. Since the recession of the glaciers, the rivers in their turn have done a vast deal of erosion, but have not yet by any means effaced from the land the hand-writing of the ice. The main Alpine region is drained on the north by the upper system of the Rhine, including the Reuss, Aar, and Thur, and by south branches of the Danube, including the Iller, Lech, Isar, Inn, and Enns; on the east by west branches of the middle Danube, including the Drave and Save; on the south by the upper Adriatic coast streams, including the Tagliamento, Piave, Brenta, and Adige, and by the northern branches of the Po, including the Mincio, Oglio, Adda, Ticino, Sesia, and Dora Baltia; and on the west by the eastern tributaries of the lower Rhone, the Durance, Isère, and the upper Rhone itself.

GEOLOGY. The Alps are the result of intense folding and faulting of the strata, carried on for a long time, the folds and faults mainly trending northeast and southwest, accompanied and followed by long continued and intense erosion by ice and water. The net result of the earth movements was greatly to elevate the surface in a broad anticline, composed of many sharp anticlines, synclines, and monoclines. Erosion has planed these off to a comparatively smooth curve, has removed the stratified beds in great part from the higher portions of the system, leaving only fragments of the older beds in limited localities, and has laid bare vast areas of the underlying gneissic rocks. Hence the higher parts of the system are composed almost entirely of gneissic and allied rocks, while upon the flanks are found stratified beds, lying in various positions with regard to the system, here lying up against it, there dipping away from it. The folding and faulting occurred in various geologic epochs, from Paleozoic times down, but was apparently most intense in relatively recent times, in the Mesozoic. They occurred at different times in different parts of the system, and not always or everywhere in the same direction, so that the result, in detail, is exceedingly complicated. The principal field of these movements, where the folding and faulting is most complicated and greatest, is north of the higher parts of the range, in other words, on the northern slope; here are found stratified beds succeeding each other in bewildering fashion. The southern or Italian slope is much simpler in structure.

CLIMATE. The Alpine region is at the meeting place of the high middle-latitude marine climate of Western Europe, the continental climate of Central Europe, and the low-latitude marine climate of the Mediterranean regions. While it does not lie directly in the main path of the cyclonic disturbances which sweep across Northern Europe from west to east, yet it does lie within the sphere of influence of these storm centres. Moreover, during the spring, numerous extended cyclones pass over the Alpine region; but they are less frequent in the winter and fall, and are almost totally lacking in the summer. This is the chief reason for the steady cold of the Alpine winter, with but few intensely cold waves, the serenity of its summer climate, and the harshness of its spring weather. The average annual temperature on the northern Alpine boundary at altitudes of 1500 feet is about 48° F., while the seasonal averages range from about 30° F. in winter to 65° F. in summer. In winter temperatures usually descend as low as zero F., and in summer rise as high as 90° F. On the southern Alpine boundary, at altitudes of about 800 feet, the average temperature for the year is about 54° F., the variations ranging from 35° F. in winter to 72° F. in summer; but in winter the temperature usually does not descend below 15° F., and in summer may reach even 95° F. With increase of altitude above these regions there is on the average for the year a decrease in temperature of about 1° F. for each 330 feet of altitude; but the rate of decrease is much more rapid in summer than in winter. The average daily temperature is remarkably uniform in the Alps; but the temperature changes from day to night are excessive, on

ALPINE SCENERY
CHILLON AND THE DENT DU MIDI

account of the intense action of the sun by day and the rapid cooling by radiation by night, as in all elevated regions. The absolute humidity decreases with the altitude, and is greater in summer than in winter. The relative humidity, and, consequently, the degree of cloudiness, is least in winter in the Alps, while in the surrounding region the relative humidity and cloudiness are usually greatest in winter.

On the north side the annual rainfall is from 25 to 40 inches; but this increases irregularly to about 90 inches on the southern side, where the steep slopes deflect upward the moisture-laden warm winds from the Mediterranean Sea. The average annual rainfall for the whole region cannot be far from 60 inches, while that of the surrounding lowlands is less than 35 inches. Where the high mountains have a copious rainfall on the windward side, the valleys on the leeward side experience a deficiency; so that on one side of a mountain range the rainfall may be many times that on the other side. Of the total annual rainfall throughout the Alps about 18 per cent. occurs in the spring and about 25 per cent. in winter. In summer the proportion decreases from 37 per cent. in the northern part to 25 per cent. in the south; but in the fall, on the contrary, the proportion increases from 20 per cent. in the north to 33 per cent. in the south. In the higher Alps much of the precipitation is of course in the form of snow, which is carried down to lower levels by glaciers and is there melted. The snow line in the Alpine mountains undergoes an annual variation, reaching its lowest altitude, about 2000 feet, toward the end of January, and its highest altitude, in the neighborhood of 9500 feet, about the middle of August. The limit differs for the northern and southern exposures, the snow line on the southern slopes lying over 150 feet higher in midwinter, and about 1300 feet higher in the early fall. At low altitudes of 2000 to 3000 feet, the snowy days much exceed the number of days on which the ground remains snow-covered, but at altitudes of 8000 feet, the first snow commonly remains throughout the season of snow. The lower limit of perpetual snow is at an altitude ranging from 8500 feet to 9500 feet.

The general winds of the Alps follow the cyclonic and anti-cyclonic laws, which give a veering through the south when the cyclones pass to the north, as they usually do, and through the north when the cyclones pass to the south. Local winds are very prevalent; among these the mountain and valley winds, blowing upward from the valleys by day and downward from the mountains by night, are the most characteristic. In the Central and Northern Alps occur these hot, dry winds called the föhn. These are the result of descending air on the leeward side of the mountains after much of the moisture has been condensed by the cold high up on the windward side. These föhn winds, while a source of discomfort to the inhabitants, are welcomed in the spring, for they clear the ground of snow much more rapidly than the sun can accomplish it. Such is the evaporating power of the föhn winds that it may cause two feet of snow to disappear in half a day.

FAUNA. The large native animals of the Alps are becoming scarcer and scarcer, by reason of the increasing number of sportsmen and the fact that the exploration habit, which is here practiced by tourists as in no other part of the world, has left scarcely a valley in untrodden seclusion. The wild cat, the brown bear, and the wolf have been driven into the more remote recesses, and are gradually becoming rare. The chamois and the ibex are found among the higher mountains, the haunts of the latter being among the inaccessible rocky solitudes bordering on the snow line. The pursuit of these animals is the most exciting and dangerous of European hunting sports. Foxes, weasels, and Alpine hares are plentiful, while otters and ermines are less numerous. The badger is common in the lower Alps, but the marmot is more distinctively an Alpine habitant, and it seems to maintain its numbers, and flourishes along with some smaller rodents in the higher altitudes even up to the snow line, the Alpine snow mouse having been found up to an altitude of 12,000 feet. The birds of the lower Alps are very numerous, consisting of the adjoining European species, and among the higher mountains are to be found eagles, hawks, and owls, and the smaller birds, choughs, snow finches, and larks. The great lammergeyer, once quite common in the higher Alps, has now become almost extinct. Game birds, such as woodcock, grouse, and partridges, are fairly abundant. Reptiles are not numerous. The lakes of the Alpine region contain a large variety of fishes; trout, salmon, and in some localities species of whitefish being the most important. Insects of all kinds flourish in the Alps. Butterflies and beetles are numerous, and extend up to snow altitudes. With increase of elevation, however, their colors become more and more subdued, and they become more and more deficient in wing power, thus necessitating a closer contact with the ground than prevails in like species below.

FLORA. The forms of plant life of the Alps differ with the altitude, ranging from those common in Europe, at lat. 46°, to those typical of the arctic regions. The main subdivision of the Alpine plant growth is therefore into altitudinal zones; with increase of altitude there is a corresponding poleward change in the flora. The Alpine slopes are noted for their verdure up to the limits of vegetation; at low altitudes are the forests and meadows, while above these are the shrub and flower-decked pastures, which are such an important feature both in the landscape and in local life. At the base of the Alps on the south side, the lemon and olive flourish; but on the whole the prosperous growth of the vine may be taken as the most significant indication of plant life. With the grape occur the hardy plants of Central Europe, grains, and the principal deciduous trees, oak, beech, ash, sycamore, maple, chestnut, and walnut. These latter are to be found up to an altitude of 4000 or 5000 feet, when they give way to the coniferous trees, which, while plentiful only up to an altitude of 6000 to 7000 feet, are in places found at still greater elevations, where the fir, the larch, and the creeping pine are the chief species seen, together with shrubs of Central and Northern Europe. The Alpine roses and violets are celebrated for their beauty. The typical Alpine plants, those which grow above the tree line, in some instances up to the region of eternal snow, are characterized by a low, clumpy growth which sends forth at the proper season flower stalks which bear beautifully colored flowers. The blossoms of many species have peculiar hairy or woolly coatings. Gentians, violets, Alpine bells, edelrue, and the world-famed edelweiss are among the beautiful flowering plants of the region. Shrubs, such as the juniper, dwarf willow, and dwarf rhododendron, also occur in some places in profusion. Above the highest altitude of flowering plants and stunted shrub growth, from 10,000 to 12,000 feet, algæ, mosses, and lichens are the only vegetable life. There is not, however, a uniform flora at the same altitude in all parts of the Alpine region. Some species are indeed common in the appropriate climatic zone throughout the whole region; but, on the other hand, some species are limited to the west Alps, while others are peculiar to the north, south, or east Alps. Some of the arctic plants are so narrowly limited in distribution as to be found only on certain mountain groups.

Bibliography. The list of writings relating to the Alps is a very long one, and embraces important works in all of the principal languages of Western Europe, French, German, Italian, and English. In fact, no other single region has been so much written about from a geographical point of view. For a detailed knowledge of the Alps, the publications of the various Alpine Clubs offer the richest sources of information. The chief of these clubs are: The English Alpine Club (organized in 1857), publishes *The Alpine Journal* (London), Deutscher (1869) und österreichischer (1862) Alpen-Verein (fused, 1874), 1800 members; *Zeitschrift des Deutschen und Oesterreichischen Alpen-Vereins* and *Mittheilungen* (Vienna); Club Alpin Suisse (1863), *Annuaire* and *L'écho des Alpes* (Geneva); Club Alpino Italiano (1863), *Rivista mensile* and *Bollettino;* Der österreichische Touristen-Club (1869), *Oesterreicheische Touristen-Zeitung* (Vienna); Le Club Alpin Français (1874), *Bulletin mensuel* and *Annuaire* (Paris); Der Verein der Naturfreunde (1877); Der Oesterreichische Alpen-Club (1878), *Oesterreichische Alpen-Zeitung* (Vienna); Le Club Alpin International à Nice (1879); Der Alpen-Club Salzburg (1880); Sannthaler Alpen-Club (1880); Der Touristen-Verein Hermagor (1882); La Società degli Alpinisti Triestini (Roveredo). For the best general description, consult: F. Umlauft, *The Alps*, translated by Louisa Brough (London, 1889); T. G. Bonney, *The Alpine Regions of Switzerland and Neighboring Countries* (London, 1868); J. Tyndall, *The Glaciers of the Alps* (London, 1896); J. Tyndall, *Hours of Exercise in the Alps* (London, 1873); Rambert, *Les Alpes suisses*, 5 volumes (Geneva, 1866-74); Desor, *De l'orographie des Alpes* (Neuchâtel, 1862); C. Lentheric, *L'homme devant les Alpes* (Paris, 1896); E. Suess, *Die Entstehung der Alpen* (Vienna, 1875); Schaubach, *Die deutschen Alpen*, 5 volumes (Jena, 1865-71); Studer, *Ueber Eis und Schnee* (Berne, 1896); Berlepsch, *Die Alpen in Natur- und Lebensbildern* (Jena, 1885); Noë, *Deutsches Alpenbuch*, 6 volumes (Glogau, 1875-88); Schlagintweit, *Untersuchungen über die physikalische Geographie und Geologie der Alpen* (Leipzig, 1850-54); Tschudi, *Das Tierleben der Alpenwelt* (Leipzig, 1892); Grube, *Alpenwanderungen* (Leipzig, 1886); Güssfeldt, *In den Hochalpen* (Berlin, 1892); Conway, *The Alps from End to End* (Philadelphia, 1900), and *Alps Described* (New York, 1904); Conway and Coolidge, *Climbers' Guide to the Alps* (London, 1890-93), which contains a bibliography; Whymper, *Scrambles Among the Alps* (London, 1893, new ed. 1900); Neumayr, *Erdgeschichte* (Leipzig, 1885-87); Suess, *Das Antlitz der Erde* (Prague, 1883-88).

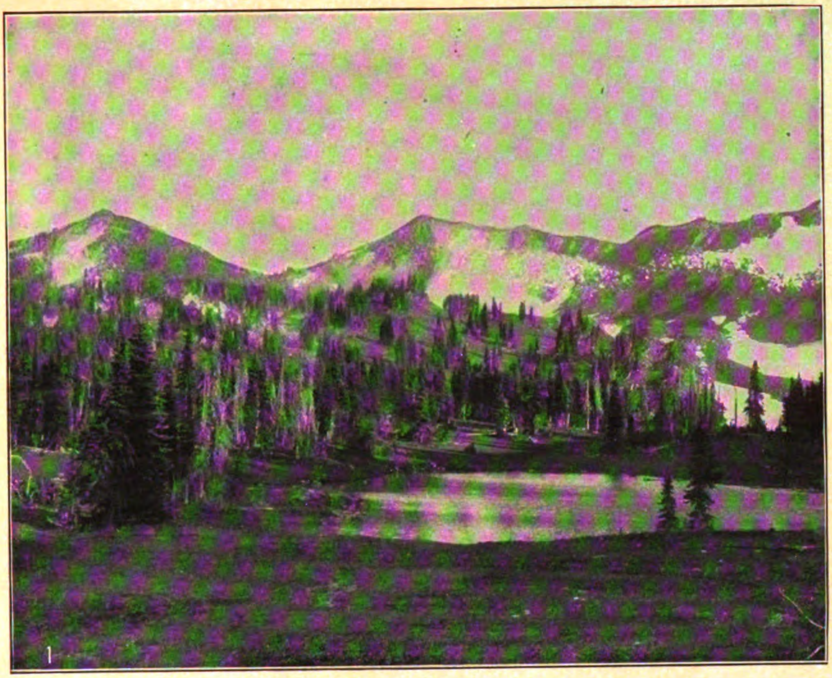
ALPUJARRAS, ȧl'pōō-hä'rȧs (Ar. *al*, the + *basharat*, herbage). A mountainous region in Andalusia, Spain, running parallel to the Sierra Nevada on its southern side (Map: Spain, D 4). It is remarkable for its narrow, deep-cut, and romantic valleys. The inhabitants are in part of Moorish descent, large numbers of Moors having taken refuge here after the fall of the kingdom of Granada.

AL-RAKIM, äl rä-kēm'. A name in the Koran (Sura xviii. 8), connected with the tale of the "Seven Sleepers." It is commonly understood to apply to the dog that guarded the "Sleepers" in their cave. But it has also been variously understood to mean the cave itself, or the valley wherein the cave was situated, or, again, the tablet set up over the entrance of the cave, enumerating the names of the slumbering occupants. See Seven Sleepers.

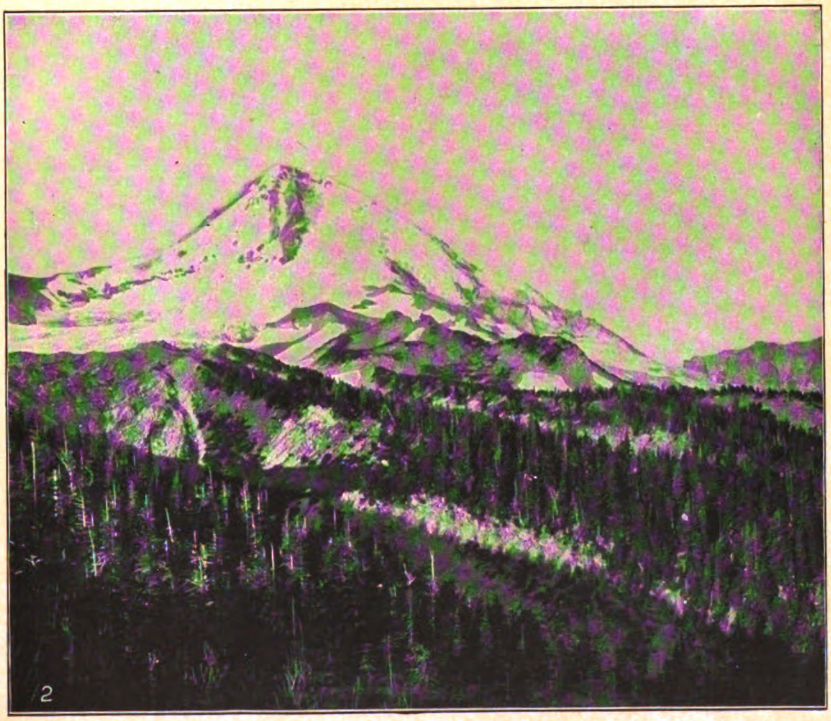
AL'REDUS, or **AL'FRED**. See Alfred of Beverley.

ALSACE-LORRAINE, ȧl'sȧs'lōr'rȧn' (Ger. *Elsass-Lothringen; Elsass*, ancient *Alsatia*, from the river *Ill* + Ger. *Sasse*, settler, tenant; *Lothringen*, the realm of Lothaire, grandson of Charlemagne). An imperial territory (*Reichsland*) occupying the southwestern end of the German Empire, and bounded by the Grand Duchy of Luxemburg, the Rhine province of Prussia, and the Rhine Palatinate on the north, Baden on the east, Switzerland on the south, and France on the west. Its area is 5603 square miles. It is divided into the districts of Upper Alsace, Lower Alsace, and Lorraine, the last being but a fragment of the old Lorraine. Alsace is bounded by the Rhine on the east and the Vosges on the west. By far the larger part of the country is flat or only slightly elevated. The eastern part of it is an extensive plain, slightly inclined toward the Rhine, where it occasionally passes into swamps and marshes. The western part is traversed by the Vosges, which attain their greatest elevation in Alsace, the Sulzer Belchen (Ballon de Guebwiller) rising to a height of nearly 4700 feet above the sea. German Lorraine is a plateau region. The offshoots of the Jura where they enter Alsace are about 2500 feet high. Alsace-Lorraine belongs entirely to the basin of the Rhine. The Ill, a tributary of the latter, rises at the southern end of Alsace and runs in a northerly direction almost through its entire length. In the north, Alsace is watered by the Zorn, Moder, and a few other tributaries of the Rhine; while the western part of Lorraine is crossed by the Moselle. The lakes are generally small, and some are used for irrigation and to furnish water power. The climate is mild, with a slight difference between the plains and the mountainous regions; the respective average summer temperatures of the two regions being 61° F. and 58°, and those for the winter being 39° and 37°. Strassburg has an average yearly temperature of 50°, while in Metz it is about 48.5°. The rainfall is abundant.

Agriculture. The soil of the country is well adapted for agriculture, and is in some parts extremely fertile. The mountainous region is devoted almost exclusively to the cultivation of fruit and the vine, which grows as high as 1300 feet above the sea. The southern end of Upper Alsace



SCENE IN THE ROCKY MOUNTAINS OF MONTANA. Alpine lake and meadow in foreground; spruces and firs and perpetual snow in background.



MT. HOOD, OREGON, SHOWING OSCILLATIONS OF THE TIMBER LINE. The trees, mostly mountain pines and hemlocks, advance farther up on the ridges than in the valleys.

is considered the most fertile part of the country, in contrast to the northern part of Lorraine, where the stony nature of the ground renders it unfit for agricultural purposes. About 48 per cent. of the land is under tillage, over 30 per cent. under forests, nearly 13 per cent. in meadows, and about 2.3 per cent. in vineyards. The land is divided into very small holdings, only about 2 per cent. of the total area being in estates of over fifty acres each. Wheat, rye, barley, and oats are the chief grains. Potatoes and sugar beets, as well as hay and hops, are produced in large quantities. The cultivation of tobacco is still very important, although it has been declining of late. The cultivation of the vine is carried on more extensively than in any other section of the German Empire. Alsace produces chiefly white wines, while Lorraine yields exclusively red wines. The value of the annual output is about 18,000,000 marks ($4,284,000). The forests of Alsace-Lorraine consist largely of foliaceous trees, and are owned to a considerable extent by the communities.

Mining. Alsace-Lorraine occupies at present the first rank among the iron producing countries of the German Empire. The growth of iron mining has been very rapid for the last decade, and, while in 1892 the production of iron ore in Prussia exceeded the output of Alsace-Lorraine by about 500,000 tons, in 1905 the latter produced over 7,837,000 tons more than Prussia. The centre of iron mining is at the western end of Lorraine, near the frontier of Luxemburg, where the highlands on the left bank of the Moselle contain vast deposits of iron and some phosphate. Coal is mined principally in the Vosges, and the annual product exceeds one million tons. The output of salt is considerable, amounting to about one-tenth of the total production of the German Empire.

Manufactures. Among the manufacturing industries of Alsace-Lorraine the production of textiles occupies the chief place, employing about one-third of the total population engaged in industrial pursuits. Cotton weaving has been carried on extensively in Alsace-Lorraine since the middle of the eighteenth century, and is at present considered the most important among the manufacturing industries. The production of textiles is carried on chiefly at Mülhausen, Kolmar, and along the numerous streams, which are utilized largely for industrial purposes. The production of woolens and yarns is very extensively developed in Lower Alsace. Linen and silk weaving establishments are also numerous. To a certain extent the production of textiles is still carried on as a house industry, especially in Lower Alsace. The iron and steel industry is next to the textile in importance. There are extensive foundries, machine shops, tool factories, and numerous other plants for the production of various iron products. The value of the annual output of the mills and foundries amounts to nearly $40,000,000. Breweries and distilleries are numerous, but supply chiefly local demand.

Transportation and Trade. The transportation facilities of the Reichsland are not behind its industries. There are over 5000 miles of highways, nearly one mile of road to one square mile of territory. Of railway lines it has over 1253 miles, or over 22 miles for every 100 square miles of territory, about the same as in the State of Illinois. The canal system of Alsace-Lorraine is one of the best in the Empire, and the Government expends large sums on its maintenance and constant extension.

Government. The supreme executive authority in Alsace-Lorraine is the German Emperor, who, prior to the introduction of the German constitution in 1874, had also the right of enacting laws for the Reichsland, with the consent of the Bundesrath. At the head of the administration is the Statthalter, appointed by the Emperor, and assisted by a ministry divided into four departments, and a Council of State. The latter is presided over by the Statthalter, and consists of the Secretary of State and a few other officials, besides a number of members appointed by the Emperor. The three districts of Lower and Upper Alsace and Lorraine are administered by presidents and councils, in which all the constituent cantons of the districts are represented. The Provincial Committee, or *Landesausschuss*, consists of 58 members, elected indirectly for a period of three years, 34 by the three district councils, 4 by the municipal councils of Strassburg, Metz, Kolmar, and Mülhausen, and 20 by the communal councils. In the Bundesrat Alsace-Lorraine is represented by two commissioners, whose functions, however, are only advisory. The revenue is obtained chiefly from direct and indirect taxes, customs, and state forests. The budget balanced in 1906 at 58,349,000 marks ($13,887,000). The public schools are under the supervision of the school board, presided over by the Secretary of State. Since the German occupation the proportion of illiterates has diminished considerably. Education is still controlled to a considerable extent by the Church, over 27 per cent. of the teaching staff consisting of clergymen and persons belonging to religious orders. Alsace-Lorraine contains one university, that of Strassburg. The population of Alsace-Lorraine in 1900 was 1,719,470, showing an increase of over 7 per cent. since 1890; in 1905 it was 1,814,564, showing an increase of nearly 5.24 per cent. since 1900. Over 76 per cent. of the people are Roman Catholics, nearly 22 per cent. Protestants, and less than 2 per cent. Jews. Strassburg, the capital, has a population of over 151,000.

History. Originally a part of Roman Gaul and inhabited by Celtic tribes, the region now known as Alsace was overrun by the Germanic nations during the fourth and fifth centuries, and was ultimately brought under the dominion of the Franks. The Teutonic invaders supplanted, to a great extent, the old Celtic inhabitants, and by the tenth century the country had become thoroughly Germanized. After the partition of the Frankish Empire, Alsace was held by the dukes of Swabia and later by the Hapsburgs, under whose rule it enjoyed prosperity. Rich and powerful towns, chief among them Strassburg and Kolmar, sprang up, and attained, in the course of time, a very large degree of self-government, entering frequently into treaty relations with other cities of the empire, and partaking fully in the intellectual and spiritual life of the German people. French ambition was directed toward Lorraine as early as the fourteenth century, though no serious attempt at conquest was made till 1552, when Henry II. took possession of Metz, Toul, and Verdun. In the peace of Westphalia, in 1648, the Hapsburgs (as rulers of Austria) ceded their territories in Alsace to France. Louis XIV. subsequently seized the numerous free cities of Alsace. Kolmar was incorporated with France in 1680 and Strassburg in 1681. The Treaty of Ryswick (1697) confirmed France in possession of Alsace.

Systematic attempts to assimilate the inhabitants, who were mainly of Germanic stock, with the French were made by the Government, but met with no success until the Revolution, when, in the general overthrow of feudalism, Germans and French were drawn together by the common ideal of democracy. The French spirit penetrated deeply into the upper and middle classes, and even the mass of the population was reconciled to French rule. When war, therefore, between France and Prussia broke out in 1870, those natives of Alsace who did not side zealously with France remained neutral. In Lorraine occurred some of the most decisive battles of the war, Gravelotte, and Vionville, and the siege of Metz. The surrender of Alsace and a part of Lorraine was made the principal condition of peace by Prince Bismarck, who acted in this as the exponent of a widespread spirit in Germany, which demanded the recovery of the ancient Germanic borderland. Alsace (with the exception of the district of Belfort), and the part of Lorraine where the French language had not supplanted the German, became a part of the newly founded empire, and were put under the direct control of the Emperor. The attempt to win back the people to German influences was greatly hampered by the vehement opposition of the Gallicized upper classes and the clergy, and the civil administration was brought almost to a standstill for a number of years by the refusal of the men elected to the district and provincial councils to take the oath of loyalty and perform their functions; the representatives to the Reichsrath were, for the most part, French irreconcilables. In 1872 the German government called upon the inhabitants to declare themselves either German citizens or French. More than one hundred and fifty thousand expressed their adherence to France, and of these nearly fifty thousand removed across the border. On the part of the German authorities a policy of severity approaching military rule was tried in alternation with one of mildness and concession, and for a long time both proved equally ineffective. The Germanization of the provinces has steadily been aimed at, however, in acts making the study of the German language compulsory in the public schools, and the use of it obligatory in the courts and legislative bodies; in the suppression of French radical newspapers, and in the establishment of higher schools of learning under German control. After 1890 the prospect of an ultimate reconciliation became brighter: a loyalist party appeared which wielded some influence in the elections. In proportion as the spirit of *revanche* grew weaker in France, and the permanent retention of the provinces by Germany became more assured, the opposition of French sympathizers in Alsace-Lorraine subsided.

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ALSA'TIA. The popular name of Whitefriars, London, which served early in the seventeenth century as a refuge for criminals; but this immunity was abolished by Parliament in 1697. See the account in Scott's *Fortunes of Nigel.*

ALSEN, äl'sen (Dan. *Als*). An island in the Baltic belonging to the Prussian province of Schleswig-Holstein, and separated from the mainland by the Sound of Alsen (Map: Prussia, C 1). Its greatest length is nearly 20 miles, its greatest breadth about 12 miles, and its area is 124 square miles. The island is very picturesque in appearance, with a fertile soil. Its lakes have fish, and its apples constitute an important article of commerce. The chief towns are Sonderburg and Nordburg, the former well fortified and with an excellent harbor. Close to the harbor are the ruins of an old and famous castle, in which Christian II., of Denmark and Norway, was confined from 1532 to 1549. In the war of 1864 Alsen was taken by the Prussians from the Danes. Pop., 1900, 2560.

AL SIRAT. The bridge from this world to the Mohammedan paradise, as narrow as a razor's edge, on which the virtuous pass to paradise, while the wicked fall into hell; derived from the Zoroastrian idea of the Chinvat Bridge.

ALSOP, ạl'sŏp, RICHARD (1761-1815). An American author, born in Middletown, Conn. Before he finished his course at Yale College, he went into business. His literary tastes caused him to join the "Hartford Wits," and later he became the principal contributor to the *Echo*, a satirical publication (1791-95). His works include a *Monody on the Death of Washington*, in heroic verse (1800); *The Enchanted Lake of the Fairy Morgana* (1808); a translation of a portion of *Orlando Innamorato*, and the *Captivity and Adventures of J. R. Jewett Among the Savages of Nootka Sound* (1815). Alsop was an accomplished linguist.

ALSTED, äl'stĕt, JOHANN HEINRICH (1588-1638). A German Protestant divine and voluminous writer, professor of philosophy and divinity at Herborn. He was born in Ballersbach, near Herborn, and died at Weissenburg, Transylvania. Of his voluminous compilations may be mentioned his *Cursus Philosophici Encyclopædia,* which includes a treatise on the use and abuse of tobacco, particularly noteworthy from its date, *Thesaurus Chronologiæ,* and *De Mille Annis.* The latter was a prophecy that the thousand years, or millennium, during which the saints were to reign on the earth, would commence in 1694.

AL'STRŒME'RIA, or **ALSTRÖMER'S LILY** (Named after the Swedish botanist, Klas von Alströmer). A genus of South American plants of the natural order Amaryllidaceæ, which is distinguished by tuberous roots and by often having the outer segments of the perianth different in form from the inner. The leaves are twisted, so that what should be the upper surface becomes the lower. The species number about 60, and are natives of the warmer parts of America. Some are sufficiently hardy to endure the open air in England, and as far north as Virginia in the United States, and are admired ornaments of flower-gardens. Some have climbing or twining stems. Among these is the salsilla (*Alstrœmeria salsilla*), a plant of great beauty, with lanceolate leaves, a native of Peru, cultivated in the West Indies, the tubers of which are eaten like those of the potato. In Great Britain it requires the hothouse. Alstrœmeria ovata, also a beautiful plant, with a slender, twining stem and ovate leaves, is cultivated in Chile for its tubers, which are used as food.

It has been introduced into Great Britain, but its cultivation has made little progress. The tubers weigh from three to six ounces. A kind of arrowroot is also prepared in Chile from the succulent roots of Alstrœmeria pallida and other species. One of the finest species for greenhouse growing is Alstrœmeria alba.

ALSTRÖMER, ăl′strē-mĕr, Klas von (1736-94). A Swedish naturalist. He had for his master and friend Linnæus, who named in his honor the genus Alstrœmeria. He visited Spain and wrote a work on the breeding of fine-wooled sheep.

ALT, ălt, or **ALTEN**, äl′ten (Ger., old). A prefix to many names in Europe, as Altdorf, old village.

ALTABAN, ăl′tȧ-băn′, or **ALTASAN**, ăl′tȧ-săn′. A head-hunting tribe in Nueva Vizcaya province, Luzon. See Philippines.

ALTAI (ăl-tī′) **MOUNTAINS** (Tatar, golden mountains, from *altun*, *altan*, golden; Chin. *keen-shan*, same meaning). A mountain range of Central Asia forming part of the elevated region on the borders of Siberia and the Chinese Empire. The name formerly had a much wider significance, and included the entire line of highlands from the Irtysh River to the Okhotsk Sea, which is composed of several structurally independent units; but it is now limited to the much smaller group lying on the borders of Mongolia, Sungaria, and Siberia, and between about 45° and 54° N. latitude. The range has a general northwest and southeast trend, nearly at right angles to that of the larger system. The Altai Mountains begin on the southeast with the Ektag range (Greater Altai), in the region of the Gobi Desert, and for some distance they form the boundary between Mongolia and Sungaria. Toward the northwest, the range increases in breadth by the converging of outlying mountains, and also in height, but after passing the Siberian frontier it gradually loses its massive character and fades out into the steppes. On the slopes of the Ektag are the sources of the Black Irtysh, Kobdo, and Urungu rivers. North of this range and across the valley of the Bukharma River are several mountainous groups which constitute the Northern Altai. The latter are arranged along an axis parallel to that of the Ektag range, and attain an extreme elevation of over 10,000 feet in Mount Byelukha (White Mountain). The Tarbagatai group, further west, may also be included with the Altai range. This group begins in Sungaria and reaches across the Siberian frontier, where it is continued by the Tschungistan Mountains into the region of the Khirgis steppes. Geologically, the Altai consist of a central core of schists and granite broken through by intrusions of igneous rocks, with Paleozoic strata ranging from the Silurian into Carboniferous on the outer edges. As the mountains were formed by upheaval at an early geological period, they have been subjected to long-continued denudation and erosion. Their crests, of which only the highest rise above the snow line, are generally well rounded, and their slopes are covered with a rich growth of grass, or with heavy forests of pine, cedar, and birch. Deer, hares, and wolves abound in the lower and bears in the higher portions of the range. The mountains are but thinly populated, except within the limits of the Russian Altai, where there is a well-developed mining industry.

ALTA′IC, and **U′RAL ALTA′IC**. Terms used of a family of languages in parts of northern, eastern, and central Europe and the greater part of northern and eastern Asia, besides still other sections. See Ural-Altaic, and Turanian.

ALTAMAHA, a̤l′tȧ-mȧ-ha̤′. A river formed by the confluence of the Oconee and Ocmulgee rivers, at the boundary line of Montgomery and Appling counties, Georgia, and flowing southeast, emptying into the sound of the same name, near Darien (Map: Georgia, E 4). It is 155 miles long, drains an area of 14,400 square miles, and is navigable for its entire length for boats drawing five feet of water.

AL′TAMONT. 1. A character in Rowe's play, *The Fair Penitent* (q.v.); the husband of Calista, the heroine, and slayer of Lothario, who has seduced her.

2. In Thackeray's *Pendennis*, a name assumed by the convict Amory on his return; the father of Blanche Amory (q.v.).

ALTAMONT, Frederick. In Scott's novel *The Pirate*, the assumed name of the pirate John Bunce.

ALTAMURA, äl′tȧ-mo͞o′rȧ. An episcopal city of Italy, 60 miles northwest of Tarentum (Map: Italy, L 7). It is beautifully situated at the foot of the Apennines, and has a magnificent cathedral, founded by Frederick II., and decorated with beautiful paintings. The country produces oil, wine, grain, and cattle, and the fairs at Altamura are attended from far and near. Pop., 1881, 20,000; 1901, 22,729.

AL′TAR (Lat. *altare* or *altar*, probably originally a high place, from *altus*, high). The place on which sacrifices were made or offerings laid or libations poured or some other act of worship performed. Altars were in use from the earliest times among the Babylonians, the Egyptians, and later peoples. Some of those mentioned in the Old Testament are among the earliest of which descriptions are recorded. The British Museum has several Assyrian marble altars highly decorated; one triangular, another oblong, with scrolls that call to mind the expression "horns of the altar," which is literally carried out in many Græco-Roman altars with ox-horns or ram-horns at the corners. The altar was primitively of two classes: Either (1) placed on some height and often nothing but a mound of earth or a heap of stones or of ashes; or else (2) the family altar connected with each dwelling, in front of the entrance. This was smaller, permanent, and more artistic. Then came the altars connected with temples, either in the outer air, in front of the temple steps, or within. The great public altars of Græco-Roman worship in historic times, at which whole hecatombs were sacrificed, and great festivals held, developed into immense artistic monuments, as for example that of Hiero at Syracuse, that of Hera at Samos, of Apollo at Delphi, and of Zeus at Olympia; the last-named was 125 feet in circumference. The famous altar at Pergamum, with sculptures representing the combat of the gods and the giants, was 40 feet high. Probably such altars and their platforms are derived from the early Pelasgic altars that stood on an immense three-stepped platform, and were the one centre of worship; for the Pelasgians had few temples. The Romans also used such colossal and artistic altars, especially to consecrate imperial worship: there was one for Spain and one for Gaul (at Lyons), with an abundance of statuary and decoration, where the Spanish and Gallic councils met annually and proclaimed their political allegiance. The Altar of Peace, with its sculptured friezes, erected in honor of Augustus, at Rome, to celebrate the pacification of the world, was one of the artistic masterpieces of the Augustan reign. Of the smaller altars and tables of offerings, hundreds were erected in every city, not only in connection with the temples, but also in shrines and chapels and throughout the streets: they are among the finest pieces of Græco-Roman decoration, and are of all shapes—circular, polygonal, square or oblong. Usually each was consecrated to a single god or hero. Of course, the use to which the altar was put influenced its form: according as it was for incense or sacred fire, for libations, for fruits, flowers, or the like, or for bloody sacrifices.

In the Christian Church the altar was quite different in its suggestions. All reminiscence of heathen altars was abhorrent. The marble sarcophagi in which were buried the bodies of martyrs in the catacombs were among the earliest altars, except, indeed, plain wooden tables which developed into marble slabs with one or more legs. Only a single altar was allowed in each church—none outside—and it was always erected over the relics of a martyr. As early as the fifth century, precious metals came into use for altars. The great variety of shape in pagan times was reduced to one—moderately oblong. The altar was placed in the axis of the church, just outside the radius of the apse, or in the middle of the transept, if there was one. Beneath it was the confession (see CONFESSION) for the relics of the saint, which afterward developed into the crypt. (See CRYPT.) Above it rose a tabernacle, canopy, or ciborium. (See CIBORIUM.) The structure of the altar itself was rarely ornamented, though in Italy the faces were often inlaid with marbles and mosaics. Nevertheless the altar usually had a number of artistic accessories that must be mentioned to give an idea of its appearance. *Altar-front* was a decoration for the front and sometimes for the other sides of the altar, not merely when the structure was a slab supported on legs, but even if it were solid. It was sometimes in the shape of a rich hanging; sometimes it was a relief of gold, silver gilt, enamel, or silver. Famous mediæval altar fronts are at the Cluny Museum (from Basel), Paris; at St. Mark's, Venice; at Sant' Ambrogio, Milan; at San Jacopo, Pistoia. *Altar-piece* is used as a decoration placed on top of the altar, a custom that did not come into use until the Middle Ages, when the altar was made to face the people and not the apse, and when altars against the wall were multiplied. Some altarpieces, complements to the altar-fronts, were of precious metals, as at Venice (St. Mark's), and at Pistoia (San Jacopo), but usually they were devotional pictures, preferably in the form of triptychs, or even groups of sculpture, or a sculptured tabernacle. *Altar-screen* is often connected with the confession and its staircase. In early churches it was surmounted by sculpture, and hardly distinguishable from an altar-rail. Consult Rohault de Fleury, *La Messe* (Paris, 1883).

ALTAROCHE, ål′tå′rôsh′, MARIE MICHEL (1811-84). A French playwright and journalist, born at Issoire. From 1834 to 1848 he was editor-in-chief of *Charivari*, the influence of which was increased by his political satires and his general wit and acumen. He was elected to the Assembly in 1848 but retired the following year, and from that time was successively manager of the Odéon, Folies Nouvelles, and other theatrical enterprises. He wrote *Chansons et vers politiques* (1835), *Contes démocratiques* (1837), *Aventures de Victor Augerol* (1838), and the following plays: *Lestocq ou le retour de Sibérie* (1836), and *Le Corrégidor de Pampelune* (1843).

ALTAZ′IMUTH (*alt*itude + *azimuth*; see AZIMUTH). An astronomical instrument, used for determining the position on the sky of stars or other heavenly bodies by measuring their altitude and azimuth. (The altitude of a star is its angular distance above the horizon, measured on a great vertical circle of the sky, perpendicular to the horizon and passing through the star and the zenith, or point directly overhead. The azimuth of a star is the angular distance, measured on the horizon, from the south point of the latter to the foot of the vertical circle upon which the altitude is measured.) The altazimuth instrument has two brass circles, one with its plane horizontal, the other with its plane vertical, and a telescope is attached to the circles. When this is directed so that a star appears at the intersection of a pair of crossed threads fixed in the field of view, it is possible to read the star's altitude and azimuth from the graduations engraved on the two circles. Being of considerable complexity, the instrument does not give results of a precision quite equal to those obtained with the meridian circle; and for this reason it is employed chiefly in its portable form when observations must be made at temporary observatories, such as eclipse expedition stations. It is in use, however, at Greenwich, for observing the moon on nights when it is not possible to observe that body in the meridian.

ALTDORF, ält′dôrf, or **ALTORF**. The capital of the Swiss canton of Uri, situated in a sheltered spot at the base of the Grunberg, about 2 miles east of the lake of Lucerne (Map: Switzerland, C 2). It lies 1475 feet above sea level, and is a well built town, having several open places, a church, a nunnery, and the oldest Capuchin monastery in Switzerland, built in 1581. The town is connected with the Tell legend—for Tell is said to have lived near by—and Tell dramas are still played here. The spot where his son stood to be shot at is marked by a bronze statue of father and child, by Kissling, erected in 1895. Southeast about 1½ miles is the entrance to the Schächenthal. Pop., 1900, 3147.

ALTDORFER, ält′dôr-fĕr, ALBRECHT (? 1480-1538). A Bavarian painter and engraver on copper and wood. The exact date and place of his birth are unknown, though the latter was probably near Landshut; but most of his life was passed at Regensburg, where he practically founded a school, and where he died Feb. 13, 1538. He was influenced to some extent by Dürer, but is of independent importance. His pictures are marked especially by romantic imagination, his landscapes, which constitute the most important part of his work as a painter, being more the creation of his own fancy than faithful transcripts of nature. But while his drawing is frequently disappointing, his coloring is rich and strong. One of his best-known works, the "Victory of Alexander at Arbela" (1529), so captivated Napoleon that it was carried off to Paris, and only restored in 1815 to the Pinakothek at Munich, where is also his "Susanna at the Bath" (1526). His work on copper, of which a hundred examples remain, entitles him to a place among the "little masters"; and he was also a practical architect. Consult Friedländer, *Albrecht Altdorfer* (Leipzig, 1891).

ALTEA, ȧl-tä′ȧ. A seaport town of Valencia, Spain, in the province of Alicante, 25 miles northeast of Alicante (Map: Spain, E 3). It stands on a rising ground at the head of a bay. It is known for its exports of raisins, and has a lighthouse on the bay. Pop., 1900, 6179.

ALTEN, äl′ten. A portion of the province of Finmarken, in northern Norway, surrounding the Altenfjord. It consists of fertile tracts, where, in spite of the high latitude, much grain is grown.

ALTEN, äl′ten, KARL AUGUST, Count of (1764-1840). A celebrated Hanoverian general in the Napoleonic wars. He entered the army in 1781, and gained distinction at Valenciennes and Hondschooten. He was first lieutenant in 1800, but after the capitulation at Lauenburg went to England, where he was made commander of a battalion in the German Legion (1803). In 1808 he assisted as general of brigade in covering the retreat of General Moore to Corunna. In 1811 he took part under General Beresford in the siege of Badajoz and the battle of Albuera, and in the following year was promoted by the Duke of Wellington. In almost all the engagements of the Spanish war of liberation—at Salamanca, Vitoria, in the Pyrenees, Nivelle, Nive, Orthez, Toulouse—Alten took a prominent part. At Waterloo he held La Haye-Sainte for hours against the French. He commanded the Hanoverian contingent of the army of occupation in France (1818), and after his return to Hanover was made Minister of War.

ALTENA, äl′tȧ-nȧ. A town of Westphalia, Prussia, in the district of Arnsberg, on the Lenne, 40 miles northeast of Cologne (Map: Prussia, B 3). The town possesses several churches and the ancestral castle of the counts of the mark. Its principal manufactures consist of iron, copper, brass, and nickel goods, one of its specialties being metal ecclesiastical vessels. Pop., 1900, 12,800; 1905, 13,594.

ALTENBURG, äl′ten-bṳrK. The capital of the German Duchy of Saxe-Altenburg, situated in a fertile country in lat. 50° 59′ N., and long. 12° 25′ E., about 24 miles south of Leipzig, near the River Pleisse (Map: Germany, E 3). Preëminent among the noteworthy buildings is the ducal castle, built upon an almost perpendicular porphyry rock, and celebrated as the scene of the abduction, in 1455, of the two Saxon princes, Albert and Ernest. A curious building is the so-called Rothen-Spitzen, composed of two connected towers, containing the State archives. Altenburg possesses several excellent educational institutions, a museum, a picture gallery, and a theatre. Its benevolent institutions include an infirmary and a hospital for poor citizens. Brushes, gloves, hats, and cigars are among the chief manufactures carried on in Altenburg, and it has a considerable trade in woolen yarn and produce, largely grain. Pop., 1890, about 31,000; 1900, 37,100; in 1905, 38,818.

ALTENDORF, äl′ten-dôrf. Formerly a commune consisting of a number of manufacturing villages in Rhenish Prussia. Altendorf is liberally supplied with schools, one of the largest being that of the famous Krupp iron works, which are located here. In addition to the iron industry, Altendorf has extensive coke, brick, and cement works. Pop., 1890, 31,900; 1900, 63,300. It was incorporated with Essen in 1901.

ALTENESSEN, äl′ten-ĕs′sen. A city in the Prussian Rhine province, about 2 miles north of Essen. It has important coal mines and machine works. Pop., 1890, about 18,000; 1900, 28,678; 1905, 33,421.

ALTENSTEIN, äl′ten-stīn. A castle in the Duchy of Saxe-Meiningen, near the watering-place of Liebenstein, and about 13 miles southeast of Eisenach, on the south slope of the Thüringerwald, the summer residence of the reigning dukes. It has a fine park, in which is a cavern 500 feet long, through which flows a large stream. St. Boniface, "the apostle of Germany," lived and preached here from 724 to 727; and near by is the place, marked by a monument, where, in 1521, Luther, while returning from Worms, was seized and carried off to the Wartburg.

ALTENSTEIN, KARL, BARON VON STEIN ZUM (1770-1840). A Prussian statesman. He was born at Ansbach, and studied at Erlangen and Göttingen. After the Treaty of Tilsit he became the head of the finance department. In 1815 he went to Paris with Wilhelm von Humboldt to claim the restoration of works of art taken from Prussia by the French armies. He was Minister of Public Worship and Education during 1817-38, and did great service for the universities and schools. Under his direction the University of Bonn was founded, and a great number of gymnasiums were opened.

AL′TERA′TION (From Lat. *alter*, other, different). In its most general sense, with reference to a written instrument or a property interest, alteration is such a change as, if effective, would result in substituting a different instrument or interest for the original. An alteration of an easement, as a right of way, consists in changing its course or boundaries. An alteration of a written instrument consists in making any material change in its language or character, such as erasing, interlining, or adding terms, or removing a seal from a deed. An immaterial change does not come under the description of an alteration. At common law, the alteration of a written instrument avoided it as against a party not assenting thereto. In England it does not matter whether the alteration is made by a party or by a stranger. In this country, a distinction is made between the two cases, and alteration by a stranger, or spoliation (q.v.), as well as alteration by a party through pure accident or innocent mistake, does not invalidate the instrument, if its original language or tenor remains discoverable. The common-law rule rests upon considerations of public policy, its object being to deter the holder of a written instrument from tampering with it, and to force him to carefully guard its integrity. By the Bills of Exchange Act in England and the negotiable instruments law in several of our States, a holder in due course of an altered negotiable instrument may enforce it according to its original tenor. See the authorities referred to under CONTRACT; DEED; NEGOTIABLE INSTRUMENT.

AL'TERATIVE (Lat. *alter*, other, another, different). In medicine, a term applied to remedies that have been found to act slowly and in an unknown way, improving the nutrition of the body. It is generally applied to medicines which are irritant in full doses, but which almost imperceptibly alter disordered actions or secretions; acting specially on certain glands, or upon absorption in general, when they are given in comparatively small doses, the treatment being continued for a considerable length of time. For example, mercury is an irritant in some of its preparations; but when small doses of some of its preparations are given at intervals for some length of time, they "produce *alteration* in *disordered* actions, so as to cause an improvement in the nutrient and digestive functions, the disappearance of eruptions, and the removal of thickening of the skin or of other tissues" (Royle); and they will effect these changes without otherwise affecting the constitution or inducing salivation. So iodine, also an irritant in concentrated doses, and poisonous in some forms, is most useful when given in small doses in certain enlargements of glands, and need not cause iodism, if carefully given. The most marked example of the alterative action of mercury and the iodides is seen in cases of syphilis.

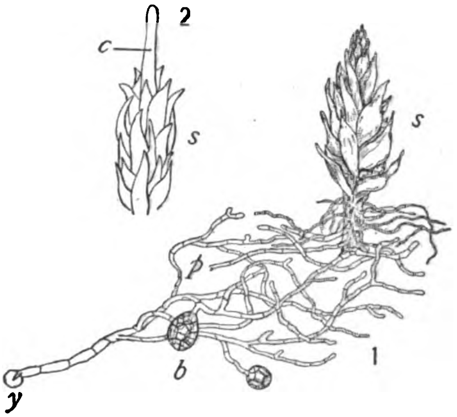
Some preparations of arsenic are powerful alteratives in cases of skin disease. Cod liver oil (q.v.) is an alterative which is used with great benefit in tuberculous conditions, rickets, and other diseases which are associated with poor nutrition. Preparations of phosphorus have a powerful alterative action. Colchicine (q.v.) is said to act in this way in gout and subacute rheumatism. Ichthyol (q.v.) is an important alterative in skin affections when applied locally. Sarsaparilla (q.v.) was formerly believed to possess strong alterative qualities, but it has been shown to be practically inert.

ALTER (äl'tĕr) **FRITZ** (Ger., Old Fritz). A popular designation of Frederick the Great.

ALTERNATING (ăl'tĕr-nā'tĭng) **CUR'RENTS.** See ELECTRICITY, and DYNAMO-ELECTRIC MACHINERY.

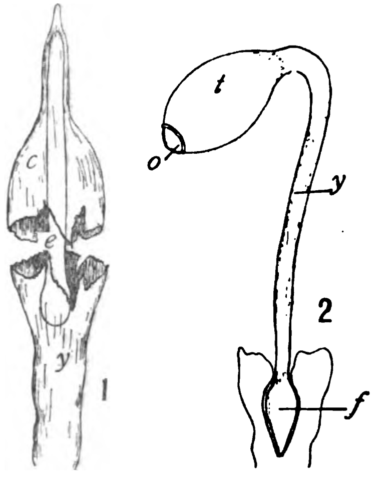
AL'TERNA'TION OF GEN'ERA'TIONS (Lat. *alternatio*, an interchange, from *alter*, other, and *generation* from *genus*, birth, descent, offspring). The successive occurrence in one life-cycle of two or more dissimilar forms; the process by which in its life history a plant or animal may pass through alternating phases that do not resemble one another, especially differing in being successively sexual and asexual. This phenomenon is very widespread among organisms, and assumes different characters in different groups of plants or animals.

AMONG PLANTS. Alternation of generations is found in all forms of plants excepting the lowest, though it is not very evident in the highest plants. One may get some conception of alternation of generations in plants by comparing it with the very different alternation of forms which occurs in the life history of a moth or butterfly. In the plant, however, instead of having a series of forms which pass into one another, our plant larva forms an egg which produces the mature form. If in the life history of a butterfly the larva should lay eggs and thus produce the mature forms, we should have something resembling the alternation of generations in plants. One of these generations has sex organs, and hence is called the gametophyte; while the other generation has no sex organs, and is known as the sporophyte. Both generations produce spores, but in a very different way. By means of its sex organs the gametophyte produces spores in a sexual way, that is, by the fusion of two sex cells, and such spores are called in general oöspores, or fertilized eggs; while the sporophyte by ordinary cell division produces spores which are called asexual spores, meaning spores which have not been formed by sex organs. In the life history of the plant, the sexual spore of the gametophyte gives rise to the sporophyte, while the asexual spore of the sporophyte gives rise, in turn, to the gametophyte, and so the alternation continues.



Life history of a Moss: 1, the gametophyte, with the protonema (*p*) developed from an asexual spore (*y*), and giving rise to buds (*b*) that develop the leafy shoot (*s*); 2, the young sporophyte (*c*) rising above the leafy shoot (*s*).

Alternation of generations is first manifested among the lowest plants (the thallophytes), but it is not completely and clearly established until the liverworts and mosses (bryophytes) are reached. The phenomenon is still more



Sporophyte (sporogonium) of a moss; *1*, the young sporophyte (*e*) rupturing the calyptra, carrying up the cap-like upper portion (*c*); *2*, a mature sporophyte, showing imbedded foot (*f*), seta (*y*), capsule (*c*), and operculum (*o*).

apparent among the ferns and their allies (Pteridophytes); but among the seed plants (Spermatophytes), while evident to the laboratory student, it is well-nigh invisible to the ordinary observer. It is to mosses and ferns, therefore, that one must go for the clearest examples of alternation of generations.

In an ordinary moss the gametophyte consists of the well-known leafy moss plant, which bears sex organs at the tips of its main stem or branches. By means of these sex organs a fertilized egg (oöspore) is formed. When the fertilized egg germinates, it produces the sporophyte, which in this case consists of a more or less elongated stalk (seta) bearing at its summit a capsule or spore case. The leafless sporophyte is anchored in the leafy gametophyte by means of an organ called the foot. This peculiar sporophyte of the moss is commonly spoken of as the fruit, and when it appears upon the leafy plants these are said to be "in fruit." The spores formed in the spore cases are asexual, and upon germination produce new leafy plants (gametophytes).

In the case of the ordinary ferns, which belong to the great group Pteridophytes, the same phenomenon may be observed, but with a striking difference. In the mosses the prominent leafy plant is the gametophyte, while in the fern the conspicuous leafy plant is the sporophyte. The gametophyte of the fern is a simple flat body (prothallium) resembling a minute liverwort. Upon this prothallium the sex organs are developed and the fertilized eggs are formed. From these fertilized eggs the comparatively large leafy fern body arises. This leafy body (the sporophyte) produces, usually upon the under side of the leaves, numerous asexual spores, which upon germination give rise again to simple gametophytes.

Among certain Club mosses and other Pteridophytes the sporophyte produces two kinds of asexual spores. The most apparent differences between these spores is that of size, and hence they are called "microspores" (small spores) and "megaspores" (large spores). The microspore upon germination produces a male gametophyte, i.e., a gametophyte which bears only male organs. The megaspore upon germination produces a female gametophyte, i.e., a gametophyte which bears only female organs. This differentiation of spores is spoken of as "heterospory," and all the higher plants are heterosporous. With the appearance of heterospory the alternation of generations passes out of the reach of ordinary observation, since the gametophytes are so much reduced as seldom to leave the spores which produce them. In a seed plant, for example, the whole visible body of the tree, shrub, or herb is a sporophyte; the pollen grains are the small asexual spores or microspores, while the so-called embryo sac in the ovule is the large asexual spore or megaspore. The male gametophyte consists of but two or three cells, which form within the pollen grain. The female gametophyte consists of more numerous cells, but they are entirely confined within the megaspore walls and hence never leave the ovule.

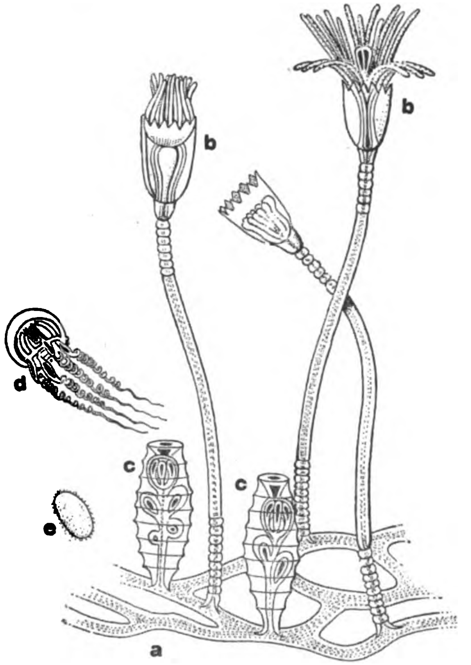
Taking the plant kingdom as a whole, it may be said that in the lowest plants only a gametophyte existed. Presently a sporophyte began to appear, at first dependent upon the gametophyte, as in the mosses, but presently attaining independence and prominence, as in the ferns and seed plants. With the independence of the sporophyte, the gametophyte became gradually reduced in size, until in the highest plants it is visible only under the special manipulation of the laboratory. The significance of alternation of generations in the plant kingdom is by no means clear. One of its results, however, is to multiply the product of a single fertilized egg. If there were no alternation of generations, one fertilized egg would result in a single new plant. By the interposition of a sporophyte bearing numerous spores, each one of which may form a new gametophyte, a single fertilized egg may result in many new plants. However, this may be but one of the incidental results of a differentiation that is probably of far deeper biological significance. Consult: Goebel, *Outlines of Classification and Special Morphology of Plants*, English translation by Garnsey and Balfour (Oxford, 1887); Vines, *A Students' Text-book of Botany* (New York, 1895); Coulter, *Plant Structures* (New York, 1900).

Among Animals. In the simplest case of alternation of generations among animals, the successive generations differ only slightly. Thus, in many butterflies having two broods during the year, the spring brood is unlike the fall brood; for example, in our "spring azure" the spring brood is of a violet color, and the fall brood is dark; both are sexual, but the spring and fall forms alternate in the series of generations. This form of alternation of generations is called *seasonal*.

The next example shows a greater difference between alternating generations. In a certain nematode (*Leptodera nigrovenosum*), both males and females are found living in pools of water or in damp earth. These pair, and the fertilized eggs develop into larvæ that enter into the bodies of aquatic animals and develop there as parasites, not as male and female individuals, but as hermaphrodites. These lay self-fertilized eggs, which develop free as either males or females. Here a diœcious generation (A) alternates with an hermaphroditic generation (B). This kind of alternation of generations is called *heterogony*.

In a third form of alternation of generations eggs are produced, but the fertilization of the egg is omitted from alternate or even several successive generations; these are then followed by diœcious, sexual individuals. To this class belong many cases of parthenogenetically reproducing species; among flat-worms, trematodes; among crustacea, the Cladocera; and among insects, aphids, such as Phylloxera, Chermes, etc. In most of these cases there is a marked difference in form between the individuals of the diœcious and the parthenogenetically reproducing generation. This class of cases is called ***heterogenesis***. See Hop-Louse.

In the fourth form of alternation, the fertilized egg develops into a generation (A) having a characteristic form, and capable of setting free neither eggs nor spermatozoa, but capable of forming buds. These buds develop into a new and different form of individual (generation B), which is diœcious and sets free zygotes, from which generation A is produced. There are numerous examples of this class among animals, e.g., among cœlenterates, the Hydrozoa and some Scyphozoa and Strobila; among flatworms, certain cestodes (Echinococcus); among Annelids, certain Syllidæ and aquatic Oligochæta; among tunicates, the Salpæ and Doliolidæ. This class of alternation of generations has been called *metagenesis*. As an example of it, one of the Hydrozoa may be taken. The free-swimming jellyfishes are diœcious, and produce the male and female gametes, which unite in the water. The larvæ which result from the development of the eggs settle down, become attached and develop into a hydroid, which produces a colony by budding. Certain buds are set free as jellyfishes, and these in turn set free the gametes. Thus the hydroid form (A) and the jelly form (B) alternate with each other.



Alternate Generations in Hydroids.

A Campanularian Hydroid: a, root-stock (hydrorhiza); *b*, *b*, hydranths; *c*, *c*, gonangia, containing medusa buds; *d*, a free-swimming, gameter-producing medusa; *e*, ciliated larva before settling down.

In certain respects the gamete-producing generation of spermatophytes among plants (see above) resembles the maturation period preceding the formation of gametes in the higher animals; and it has been suggested that even in vertebrates, including man, we have an alternation of generations: (1) the non-sexual generation beginning with fertilization and ending with the primary oöcyte or primary spermatocyte; (2) the sexual generation beginning with the primary germ-cell and ending with the ripe germ-cell (two-cell division).

Bibliography. J. J. S. Steenstrup, *On the Alternation of Generations*, translated by Busk (London, 1845); J. V. Carus, *Zur nähern Kenntniss des Generationswechsels* (Leipzig, 1849); R. Leuckart, *Ueber den Polymorphismus der Individuen, etc.; ein Beitrag zur Lehre vom Generationswechsel* (Giessen, 1851).

AL′TERNA′TOR. See Dynamo-Electric Machinery.

ALTGELD, ält′gĕld, John Peter (1847-1902). An American politician. He was born in Germany, and was brought to the United States when an infant. His parents settled near Mansfield, O. He entered the Union army at the age of sixteen, and fought until the close of the war. He at first taught school, then studied law, and was admitted to the bar in 1869, his election as State Attorney of Andrew County, Mo., following in 1874. He was judge of the superior court of Chicago from 1886 to 1891, and Governor of Illinois from 1893 to 1897, in which capacity his pardon of the anarchists Fielden, Neebe, and Schwab excited wide comment. As a prominent advocate of free silver, he was an active supporter of William J. Bryan during the Presidential campaigns of 1896 and 1900. He did much to advance the cause of prison reform, and was a vigorous and effective public speaker.

ALTHÆ′A (Gk. ἀλθαία, *althaia*, wild or marsh mallow). A genus of plants of the order Malvaceæ, differing from the true mallow, *Malva*, chiefly in its six to nine-cleft calyx. The species, natives of Europe and Asia, and naturalized in North America, are annual and perennial shrubby plants that are much grown for their showy flowers. The more common species are the marsh-mallow, *Althæa officinalis*, and the hollyhock, *Althæa rosea*. The name Althæa is applied also by gardeners to the Rose of Sharon, *Hibiscus syriacus*. See Hollyhock; Marsh-Mallow; Hibiscus.

ALTHÆA, or **ALTHEA** (Gk. Ἀλθαία, *Althaia*). In Greek story, the mother of Meleager (q.v.), whose life the Fates had told her should last as long as a log of wood burning upon the hearth at his birth should be unconsumed. She quenched and long preserved it, but finally in anger at him set it on fire and so ended his life. She was the daughter of Thestius, wife of Œneus, King of Calydon, and mother also of Tydeus and Deïanira.

ALTHE′A. In Richard Lovelace's *To Althea from Prison, and Other Lyrics*, a poetical name applied to his love Lucasta, who is understood to have been Lucy Sacheverell.

ALT′HORN. See Saxhorn.

AL′THORP, Lord. See Spencer, John Charles.

ALTHU′SIUS, Johannes (1557-1638). Professor of law and ethics at Herborn. He published the first treatise on politics written in Germany. He made the basis of social life an express or implied contract between associated men, thus anticipating Rousseau's famous social contract theory. He defended resistance to usurpation of the rights of the people, from whom all rights proceed. He put combinations of workmen in the category of monopolies to be regulated. His chief works are: *Politica Methodice Digesta* (Herborn, 1603); *Jurisprudentia Romana* (Herborn, 1588); *Dicæologicæ Libri Tres Totum et Universum Jus, quo Utimur, Methodice Complectantes* (Herborn, 1617).

ALTIM′ETRY (Lat. *altus*, high + Gk. μέτρον, *metron*, measure). The art of ascertaining altitudes geometrically or measuring vertical angles by means of a quadrant, sextant (q.v.), or theodolite (q.v.). When used for this purpose, the instrument is known as an altimeter.

ALTIN, äl-tĭn′, Altyn-Nor (Tartar *altun*, golden + *nor*, lake), or Telets Lake. A fresh-water lake in the government of Tomsk, Siberia (Map: Asia, H 3). It is in the Altai Mountains, 1600 feet above the sea level and has an area of about 184 square miles. This lake is remarkable because in winter the northern part is frozen so as to bear sledges, while the southern part has never been known to freeze.

AL′TITUDE (Lat. *altitudo*, height, from *altus*, high, lofty). In astronomy, the elevation of a heavenly body above the horizon. It is measured not as a linear distance, but by the angle which a line drawn from the eye to the heavenly body makes with the horizontal line, or by the arc of a vertical circle intercepted between the body and the horizon. Altitudes are measured by means of a telescope attached to a graduated circle. (See CIRCLE.) The telescope being directed toward the body to be observed, the angle which it makes with the horizon is measured on the graduated circle. The altitude thus observed must receive various corrections—the chief being the parallax (q.v.) and refraction (q.v.)—in order to get the true altitude. At sea, the altitude is taken by means of a sextant (q.v.), and then it has further to be corrected for the dip of the visible horizon below the true horizon. (See HORIZON.) The correct determination of altitudes is of vital importance in the problem of navigation. The sextant is the only astronomical instrument of precision that can be used without a fixed support on the deck of a rolling ship, and it is essentially an instrument for measuring altitudes. See SEXTANT; ALTAZIMUTH; LATITUDE.

ALTMÜHL, ält′mụl (Ger., old mill). A tributary of the Danube, rising at the western border of Bavaria, flowing northeast through the Swabian Jura, and joining the Danube at Kelheim (Map: Bavaria, D 4). It is 100 miles long, and connected with an affluent, the Main, by the Ludwig's Canal.

AL′TO (Ital., high). The deepest or lowest species of voice met with in boys or castrates, the voice of women being more properly called contralto. In England the alto voice is often found in adults, especially among the ballad singers; the head notes are carefully developed to abnormal volume and power at the expense of the lower notes, which gradually become atrophied and assume the same timbre as the upper register. It is curious that the original name *altus* meant the highest voice in ecclesiastical music. It represented the changing, undulating melody sung over the *cantus firmus* (q.v.), but owing to its difficulty, it could not be learned by boys, and thus to men with the highest voices was assigned the part, as women were excluded from church choirs—*mulier taceat in ecclesia*—i.e., let women be silent in the church.

ALTON, ąl′ton. A city and railroad centre of Madison Co., Ill. It is picturesquely situated on limestone bluffs, 200 feet above the Mississippi River, which is spanned here by the great bridge of the Chicago, Burlington and Quincy Railroad, 25 miles above St. Louis (Map: Illinois, B 5). Alton has a public library and a park, called Rock Spring Park. At Upper Alton is Shurtleff College (Baptist), organized 1827, and, at Godfrey, the Monticello Female Seminary. Alton is on the Chicago and Alton and other railroads, is the centre of a large commerce, and has glass factories, flouring mills, agricultural and mining tool factories, etc. Alton was settled in 1783, incorporated in 1835, and is governed by a charter granted under a general law of 1876. The mayor is elected for two years; the city council is made up of fourteen members, and town meetings are held yearly to levy the town tax and approve the supervisor's report. The mayor appoints the school board and the heads of the police and fire departments, with the approval of the council. On November 7, 1837, occurred here the famous anti-abolitionist riot, in which Elijah P. Lovejoy was killed and his printing-office demolished. Pop., 1890, 10,294; 1900, 14,210; in 1903 (est.), 15,386.

ALTON (ąl′ton) **LOCKE, TAILOR AND POET.** A novel by Charles Kingsley, published 1850.

ALTON, JOHANN SAMUEL EDUARD D' (1803-54). A German anatomist, son of the anatomist and archæologist Joseph Wilhelm Eduard d'Alton. He studied medicine at Bonn, and became professor of anatomy at the Academy of Arts in Berlin in 1827. In 1834 he was made professor of anatomy and physiology at Halle. His writings include: *Handbuch der menschlichen Anatomie* (Leipzig, 1848-50), *De Monstris* (Halle, 1853), and *De Monstrorum Duplicium Origine* (Halle, 1849).

ALTONA, äl′tō-nȧ. The largest and richest city in the Prussian province of Schleswig-Holstein, situated on the right bank of the Elbe, its eastern boundary adjoining the Hamburg suburb of St. Pauli (Map: Prussia, C 2). From a commercial point of view, Altona forms one city with Hamburg. In 1888 it entered the German Customs Union. On account of its advantageous situation on the Elbe and railway connection with other German cities, its trade is of considerable importance, and extends to England, France, the Mediterranean Sea, and the West Indies. There are many important industrial works in Altona, among others, cotton and woolen mills, iron foundries, glass works, breweries and distilleries, and establishments for the manufacture of chocolate, cigars, cotton, soap, leather ware, etc. Local transportation is afforded by numerous street-car lines, which also connect Altona with Hamburg. These are all in the hands of private corporations. The rise of Altona to its present importance has been recent, and rapid for a Continental town. In 1880 its population was 91,000, from which it had grown to 161,507 in 1900, and to 168,301 in 1905.

The streets of Altona are broad and for the most part regular, and well lighted by electricity. The city has only about fifty acres laid out in parks. This, however, does not include the suburbs. Among the notable buildings may be mentioned the Rathaus, the palace of justice, the custom house, and the city theatre. Among the objects of greatest interest in the city is the old cemetery of the Portuguese Jews.

The city's affairs are administered by a municipal council composed of 35 members, and an executive board composed of nine members. (See PRUSSIA, paragraph *Government.*) The street-cleaning of Altona is a model of thoroughness.

The city owns its water works, containing a filtering plant by means of which the water of the Elbe is purified for drinking purposes. The plant yields an annual profit of about $90,000. Its system of sewers is practically similar to that of Hamburg. It has not as yet adopted the system of sewage farms, which has proved so successful in some of the German cities. The annual expense of drainage and sewerage is about $12,000.

Altona has an organized fire department, which forms one of the chief items of expense in the city's budget, amounting annually to about $44,000. Altona owns and operates its own gas works at a net profit of about $75,000 annually. Its electric light plant is owned and operated by a private company, which pays the city 10% of its receipts.

Among the charitable and benevolent institutions are a public poorhouse, an infirmary, insane asylum, a house of refuge for boys, one general hospital, two hospitals for children, and a lying-in hospital. Its educational institutions include a gymnasium, three high schools, several technical schools, twenty-seven grammar schools, and a museum.

Altona was settled in 1536, and rapidly developed into a prosperous commercial town. In 1640 it came under the rule of Denmark. Its trade suffered during the Napoleonic wars, but revived with peace. In 1866 it was annexed to Prussia. Consult H. Meyer, *Hamburg und Altona* (Hamburg, 1836).

ALTOONA, ăl-tōō′nȧ. A city in Blair Co., Pa., 117 miles east of Pittsburg, on the Pennsylvania Railroad (Map: Pennsylvania, C 3). It is at the eastern base of the Alleghany Mountains, between Alleghany Mountain and the Brush Mountain, situated amid the most picturesque mountain scenery, the city itself having an elevation of 1180 feet above the sea level. Altoona is a typical American railroad town, its industries centring principally in the immense shops of the Pennsylvania Railroad, which employ several thousand operatives and have an extensive production of locomotives, passenger coaches, and freight cars. The city contains a public library and hospital, and Lakemont Park. Of particular interest is the famous Horseshoe Bend, near the city. The government is vested in a mayor, elected every three years, a bicameral city council, and subordinate administrative officials. There are municipal water-works, built in 1860 and acquired by the city in 1872, which cost about $680,000. Altoona spends annually in maintenance and operation about $565,000, the principal items of expense being $280,000 for schools, $35,000 for the fire department, $97,000 for the water-works, $50,000 for the police department, and $20,000 for municipal lighting. Altoona was founded in 1850 by the Pennsylvania Railroad Company, was incorporated as a borough in 1854, and chartered as a city in 1868. The great railroad strike of 1877 caused considerable excitement, and troops were ordered out to protect the company's property. Pop., 1880, 19,710; 1890, 30,337; 1900, 38,973; 1905 (local est.), 53,000.

ALTOONA, or AL′LATOO′NA, PASS. A pass near Allatoona, Ga., the scene, on October 5, 1864, of one of the most hotly contested of the minor battles of the Civil War. In his operations about Atlanta, General Sherman made Allatoona his secondary base, and stored there one million rations of bread, which General Hood determined to capture, detailing General S. G. French for the enterprise. As soon as Sherman was aware of Hood's designs he ordered General Corse (q.v.), stationed at Rome, to move with the utmost speed to the assistance of the small garrison, to hold the place against all odds, until the arrival of reënforcements. Accordingly, with a force of less than 2000, he maintained the defense against some 4000 Confederates from nine in the morning until three in the afternoon, when General French, alarmed by the approach of Federal reënforcements, withdrew. The loss in killed, wounded, and missing was about 700 on each side. An interesting account of the engagement is given in General Sherman's *Memoirs* (New York, 1888).

ALTORF, ȧlt′ôrf. See ALTDORF.

ALTO-RILIEVO, ăl′tō-rē-lyā′vō (Ital. high-relief). The term used in sculpture to designate that mode of representing objects by which they are made to project strongly and boldly from the background without being entirely detached. In alto-rilievo some portions of the figures usually stand quite free, and in this respect it differs not only from *basso-rilievo*, or low-relief, but from the intermediate kind of relief known as *mezzo-rilievo*, or semi-relief, in which the figures are fully rounded, but where there are no detached portions. A fourth term in the series is *cavo-rilievo* (q.v.), where the relief is sunk below the ground surface. A fifth Italian term is *stiacciato*, to describe what is really drawing or outlining on marble or stone with little or no relief. It was used mainly in the background of Renaissance reliefs as the furthest plane and as merely suggestive, beyond the work in basso-rilievo. These five terms cover every possible variety of relief. Their historic use is given under RELIEF SCULPTURE and SCULPTURE, HISTORY OF. In order to be in high-relief, objects ought actually to project somewhat more than half their thickness, no conventional means being employed in this style to give them apparent prominence. In low, or bas-relief, on the other hand, the figures are usually flattened; but means are adopted to prevent the projection from appearing to the eye to be less than half; because if an object projects less than half, or, to state it otherwise, is more than half buried in the background, it is obvious that its true outline or profile cannot be represented. This rule, that in all reliefs there shall be either a real or an apparent projection of at least half the thickness of round objects, was strictly observed in the best period of Greek art; but it has been often neglected in the execution of reliefs in later times, and hence attempts have been made at foreshortening and perspective, which have necessarily resulted in partial failure. For illustration of relief, see article GHIBERTI.

ALTÖTTING, ălt-ĕt′ĭng. A place of pilgrimage not far from the Inn, situated in one of the most beautiful and fertile plains of Upper Bavaria (Map: Bavaria, E 4). Multitudes of Catholics from Germany and Austria visit the ancient chapel containing a black wooden image of the Virgin (the Black Virgin), dating back to the eighth century, and great treasures of jewels, the hearts of Maximilian I. and of many princes of the Bavarian family are interred there. In the Peter and Paul's Chapel lies the body of Count Tilly. Altötting was originally a *villa regia*, where several German emperors held their court. From 1838 to 1873 it was the headquarters of the Redemptorist Fathers, and at present is the site of a Capuchin monastery.

ALTRANSTÄDT, ält′rȧn-stĕt. A village in Saxony, 15 miles west of Leipzig (Map: Prussia, E 3). It is famous as the place where Augustus II., Elector of Saxony and King of Poland, concluded a treaty with King Charles XII. of Sweden in 1706. Pop., 1900, 823.

ALTRI'CES (Lat. nom. pl. of *altrix*, a female nourisher). A term used in ornithology (opposed to *Precoces*) to designate birds whose young are hatched in a helpless condition and require the care of the parent birds. Such birds usually build some sort of nest, where the young remain for some time after hatching. The young are usually naked when hatched. Nearly all land birds (except most game birds), and some water birds, as herons, pelicans, etc., are altricial. See BIRD, and NIDIFICATION.

ALTRINCHAM, ąl'trĭng-am. A market town of Cheshire, England, on Bowden Downs, 6 miles southwest of Manchester (Map: England, D 3). It is situated on two railway lines and near the Bridgewater Canal, which has contributed greatly to its prosperity. It is a very neat and clean town, and on account of the salubrity of the air is a favorite residence of many of the merchants of Manchester. It has manufactures of artificial manures, cotton goods, and an iron foundry; but the chief employment of its inhabitants is the raising of fruits and vegetables for the market of Manchester. Altrincham was a prosperous town in the time of Edward I., from whom it received many privileges. Pop., 1891, 12,400; 1901, 16,800.

ALTRUISM, ăl'trōō-iz'm (Ital. *altrui*, of, to, or for others, from Lat. *alter*, another). A word first coined in French by Comte (*altruisme*), and introduced by his Positivist followers into English as the antonym of egoism or selfishness. It signifies consideration for others and a due regard for their feelings and interests. Altruism is regarded by Positivists as the crowning virtue, in the exercise of which the perfected individual will find not only his duty but his chief pleasure. The word is now used far beyond the circle of Positivists, sometimes quite loosely in the sense of action resulting in the welfare of others, whatever might be the motive; sometimes more strictly in the sense of conduct motived by the desire for this welfare. It is only in this stricter application that the word has any significance for ethics. One of the most important problems of ethics is that concerning the relations between one's own interests and those of others, in so far as these interests enter as motives into conduct. There are two rival issues to the question. One school maintains that self-sacrifice is the supreme moral principle, the other champions self-assertion. This difference gives occasion to another use of the terms altruism and egoism. The view that altruism is the highest moral motive is itself called altruism, just as the view that acknowledges the primacy of egoism among moral motives is itself called egoism. For the criticism of these two views and for bibliography, see ETHICS; HEDONISM, and UTILITARIANISM.

ALTRUISTS, SOCIETY OF. See COMMUNISTIC SOCIETIES.

ALTSCHUL, ält'shōōl, ELIAS (1812-65). An Austrian physician of Jewish extraction. He was born at Prague, and studied medicine, graduating at the University of Vienna in 1832. He became professor of medicine at the University of Prague in 1848, and in 1853 founded the first homeopathic magazine in Austria, under the title of *Monatsschrift für Theoretische und Praktische Homöopathie*. He introduced homeopathy at the University. His principal works are: *Dictionnaire de médecine oculaire* (Vienna, 1856, 2 volumes); *Lehrbuch der Physiologischen Pharmacodynamik* (Prague, 1850-52); *Das therapeutische Polaritätsgesetz* (Prague, 1852).

ALTWASSER, ält'väs-er. A town of Silesia, Prussia, 40 miles southwest of Breslau. It has coal mining industries and manufactures of machinery, porcelain, and mirrors. Pop., 1900, 12,144; 1905, 15,267.

ALT-ZABRZE, ält-zäb'zhe. See ZABRZE.

AL'UM (Lat. *alumen*, of unknown origin). A double salt consisting of a sulphate or selenate of the monovalent element or radicle, and a sulphate or selenate of a sesquioxide, that crystallizes in the isometric system with twenty-four molecules of water. The principal alums of commerce contain potassium, ammonium, or sodium, and the sesquioxide of aluminum.

Potassium alum is a white, astringent, saline compound, found native as *kalinite*. It is made by calcining carbonaceous shales, the residue from which is digested with sulphuric acid, yielding aluminum sulphate; to this potassium sulphate is then added, the resulting crystals constituting the alum. Another method consists in dissolving the alumina derived from the minerals cryolite or bauxite in sulphuric acid and treating the solution with potash or ammonia.

Ammonium alum is found native as *tschermigite*, and is artificially made by combining ammonium sulphate with aluminum sulphate as previously described. The low cost of ammonium sulphate, obtained as a by-product in the manufacture of illuminating gas, has led to the substitution of this alum in commerce for potassium alum. The properties of the ammonium and potassium alums are similar, though the ammonium compound is less soluble in water.

Sodium alum is found native as *mendozite*, and is made by the combination of sodium sulphate with aluminum sulphate.

Alum is used as mordant in dyeing, to clarify liquors of various kinds and especially water, to harden tallow, fats, and gypsum in the tanning of leather; the ammonium alum is used in the manufacture of baking powders. A potassium chromium sulphate, called *chrome alum*, and an iron aluminum sulphate called *iron alum*, are also used in the arts. Consult J. Gardner, *Acetic Acid, Vinegar, Alum, Ammonia, etc.* (Philadelphia, 1885).

ALU'MINA (from *alum*). Aluminum oxide, the most abundant of the earths. It is found native, nearly pure as corundum; with minute quantities of metallic oxides, as ruby, sapphire, Oriental amethyst, Oriental emerald, and Oriental topaz; and less pure as emery. It is also found in combination with silica, as in many of the minerals of the feldspar group, as well as in certain igneous rocks.

Alumina is known in two forms: A white, soft, pulverulent variety, and a colorless crystalline variety. It may be prepared in a pure state by heating potash alum with a solution of ammonium carbonate; the resulting aluminum hydrate is well washed, dried, and ignited, the residue being pure alumina. A comparatively pure alumina may also be obtained by heating ammonium alum until its volatile constituents are driven off. When alumina is precipitated from a solution containing some coloring matter, such as logwood, it carries down the color with the flocculent precipitate, forming colored insoluble salts called *lakes*. It is this property that has led to its extensive use as a mordant in dyeing. Corundum, sapphire, and ruby have been made in Paris from alumina.

ALUMINITE. A hydrous aluminum sulphate found in compact white masses, in beds of clay.

AL'UMIN'IUM or **ALU'MINUM** (From Lat. *alumen*, alum). A metallic element, next to oxygen and silicon the most widely distributed. It is not found native, but in combination, chiefly as an oxide in the mineral corundum (ruby, sapphire, and emery); as a hydrated oxide in bauxite, hydrargillite and diaspore; and in combination with oxygen and metals as aluminates, as in spinel, chrysoberyl, and gahnite. It also occurs as a silicate in various clays. Its chief ores are bauxite and cryolite (aluminium-sodium fluoride). The elementary nature of aluminium was recognized by Davy and others, but the metal was not isolated until 1828, when Wöhler succeeded in decomposing aluminium chloride by the action of potassium. Deville, in 1854, obtained the metal by electrolysis. Deville's experiments attracted the attention of Napoleon III., under whose patronage a metallurgical plant was established at Javelle, France. Ingots of the metal were exhibited at the World's Fair held in Paris, 1855. In 1886 Hamilton Y. Castner, of New York City, invented an important process for the reduction of aluminium, comprising an improved method of obtaining sodium, by which the price of that reducing agent was lowered from one dollar a pound to one-fourth that amount. He established a plant in Oldbury, England, and began the commercial production of aluminium. Meanwhile, Hall, of Pittsburg, Pa., and Héroult and Minet abroad, perfected electrolytic methods for the reduction of aluminium. In Hall's process the alumina is held in solution by a molten fluoride bath, which is itself not decomposed by the electric current. The latter is conveyed to the melted solution by means of carbon cylinders placed in the bath for positive electrodes, a carbon-lined pot forming the negative electrode. The oxygen of the alumina goes off at the positive electrode as carbon dioxide, wearing away the carbon at the rate of nearly a pound of carbon to the pound of aluminium produced. The reduced metal settles at the bottom of the pot, which is easily tapped, yielding a metal of 99 per cent. purity. The Pittsburg Reduction Co., the sole producer in the United States, erected works for the reduction of aluminium by the Hall process in 1889 near Pittsburg; and in 1895, taking advantage of the power obtained from the Falls, a large electrolytic plant at Niagara. Extensive litigation between the Electric Smelting and Aluminium Co. (Cowles) and the Pittsburg Reduction Co. was brought to a compromise in 1903, whereby the latter company operates under a license to the former. The world's production of aluminium in 1903 was 8252 metric tons, of which the United States produced 3311 tons valued at $2,840,900. In 1855, the first year of its commercial existence, aluminium sold at $90 per pound; in 1870 it was $12 per pound; in 1889 the Pittsburg Reduction Co. sold it at $2 per pound, and in 1904 aluminium 99.75 per cent. pure was sold at 33 cents per pound.

Aluminium (sym. Al., at. wgt. 27.11) is a white metal with a bluish tinge, is extremely malleable, and has a specific gravity of 2.56, which may be increased to 2.68 by rolling. In its tensile strength it ranks with cast iron, breaking at 15,000 pounds to 20,000 pounds per square inch, but in malleability and ductility it ranks with gold. Like gold and silver, it hardens in working, and rods and wire vary in strength from 26,000 pounds to 62,000 pounds per square inch. The electrical conductivity of aluminium is about 50, with copper at 90, and silver at 100; and its thermal conductivity is 38, with copper at 73.6, and silver at 100. It is also sonorous. Aluminium is a little softer than silver, but its ductility allows it to be drawn, punched, or spun into almost any form. It is practically non-tarnishable, but strictly speaking, after long exposure to the atmosphere, its polish becomes dulled by a very thin film of white oxide. Aluminium is not acted upon by hydrogen disulphide, carbon monoxide, carbon dioxide, or sulphurous acid. It is practically unaffected by common salt, either wet or dry, and hence by sea water. On the other hand, solutions of the caustic alkalies readily attack it, and hydrochloric acid is its natural solvent. Aluminium forms alloys with most of the metals. Those with copper, silver, and tin are much used on account of their color, hardness, and stability, and the ease with which they are worked. (See ALLOYS.) Those with copper are called aluminium bronzes, and those with silver are known as *tiers argent*. The lightness of metallic aluminium, subsequent to the improved processes for its manufacture, suggested its application as a substitute for iron, tin, or copper; but as yet it has failed to supersede any of these metals, on account of its high price. Its most important use is still in the form of alloy, especially with copper; but it has received growing favor in the manufacture of cooking and table utensils, and as a substitute for heavier metals in opera glass mountings and other optical instruments. An application of aluminium that promises favorably is in the manufacture of accoutrements for military purposes. The use of aluminium for electrical conductors as a substitute for copper is increasing. Owing to its lightness, the necessary cross section to insure equal conductivity with copper can be secured without undue weight, and the question seems to be largely one of expense, with the advantage at present in favor of aluminium.

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ALUMINO-THERMICS. A term applied to that branch of metallurgy in which the heat, developed by burning metallic aluminum, is utilized: 1, to reduce other metals from their oxides; 2, to raise the temperature of juxtaposed metals so that welding by pressure may be accomplished; or 3, to obtain molten iron for use in repairing broken iron pipes and shafts.

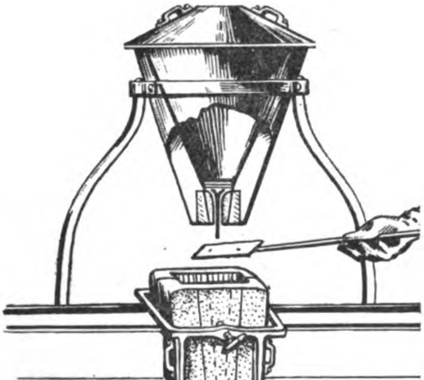
The principle of the reduction of metallic compounds by aluminum has long been known.

Friedrich Woehler, the discoverer of aluminum, tried in 1857 to produce metallic chromium from chromium chloride by means of metallic aluminum, and succeeded in making a chromium-aluminum alloy. The great difficulty in utilizing the reducing power of aluminum for practical purposes has been the fact that the reaction takes place only at very high temperatures and with explosive violence. Dr. Hans Goldschmidt of Essen, Germany, has succeeded in overcoming the practical difficulties, and has evolved the "Goldschmidt process," which has found wide practical application in several departments of mechanical engineering.

The chemical reaction involved in this process is strongly exothermic, so that it is only necessary to start it at one point of the mixture, the heat thus liberated being sufficient to raise the adjacent parts to the temperature of reaction, and so on until the entire mixture has been acted upon. In order to start the reaction, barium peroxide is used. The chemistry of the reaction is very simple and is shown by the following formula:

$$Al + M_2O_3 = M_2 + Al_2O_3,$$

where M represents the metal to be reduced. In practice the metallic oxide, mixed with the proper proportion of powdered aluminum, is placed in a base-lined vessel, and a small quantity of barium peroxide and powdered aluminum is laid on the top of the mixture. The reaction is started either by igniting a small piece of magnesium ribbon, or by touching a red-hot iron rod to the mixture. In a few seconds the entire mass becomes white-hot and molten; the reduced metal collects at the bottom and the molten aluminum oxide (artificial corundum) floats on top. The temperature of the molten mass has been estimated to be 3000° C. (over 5400° F.).



GOLDSCHMIDT PROCESS FOR RAIL-WELDING, SHOWING CRUCIBLE AND MOULD.

The Goldschmidt process is used to manufacture pure metallic chromium *absolutely free from carbon.* Made in the electric furnace, or by reduction with carbon, chromium contains impurities and up to 12 per cent. of carbon, which renders it useless for the manufacture of chrome steel. Manganese, also produced extremely pure by this process (up to 99 per cent. of manganese), is used in the manufacture of special steels containing as much as 12 per cent. of manganese, and as these steels are finding increased application the matter is one of some importance. The chief use of this carbon-free metal, however, is in making special brasses, bronzes, and other important alloys.

Probably the widest application of the Goldschmidt process is that of a mixture of iron oxide and aluminum, called "thermit," for repairing iron and steel objects by welding. As applied to welding iron pipes, rods, or similar objects, the ends, clamped against each other are enclosed in a temporary mold containing the thermit, which is then ignited. The heat evolved rapidly raises the temperature of the iron objects to the welding-point, and set-screws force them together to form a butt-weld. As applied to repairing broken castings, the pieces are welded together by white-hot molten iron. The thermit is placed in a special crucible and the molten product poured directly on the iron pieces. The intense heat softens the surfaces of the solid pieces and causes them to become firmly cemented together by the solidifying molten metal. This result, called a fusion-weld, is largely used for welding electric-traction girder-rails, where a continuous joint is desired for conductivity in order to diminish resistance. It is also used to repair broken gear-wheels, propeller and crank-shafts, steamship stern-posts, connecting-rods, locomotive-frames, wheels, etc. The enormous advantage in repairing the objects in place is obvious, particularly in the case of steamships where important repairs can be made without removing the parts. This is strikingly illustrated in repairing the stern-post, propeller, blades, shafts, and other parts of a vessel directly accessible when the latter is in dry dock.

JOINING RAIL ENDS BY THE USE OF "THERMIT."

AL'UM ROOT. A name given in the United States to two plants, very different from one another, but agreeing in the remarkable astringency of their roots. One of these, Geranium maculatum (see GERANIUM), very much resembles some of the species of Geranium which are common weeds in Great Britain. The root contains 12.27 per cent. tannin, gallic acid, pectin, and red coloring matter. The tincture of the root is of use in sore throat and ulcerations of the mouth, and is also administered in various diseases. The property of astringency belongs, in an inferior degree, to some other species of Geranium, and of the kindred genera Erodium and Pelargonium. The other American plant to which the name alum root is given is Heuchera Americana, of the natural order Saxifragaceæ (see Saxifrage), an order in which also astringency is a prevalent property. The genus Heuchera has the calyx 5-cleft, undivided petals, five stamens, with remarkably long styles. Heuchera Americana is everywhere covered with a clammy down; the leaves are roundish, lobed, and toothed; the peduncles, dichotomous and straggling. The root is a powerful styptic, and is used to make a wash for wounds and obstinate ulcers.

ALUM SHALE. A variety of shale or shaly sandstone containing iron pyrites, which on weathering yields alum. In the process of weathering, the pyrite decomposes and the products of decomposition, reacting on the alumina of the shale, yield limonite and alum. The same process can be hastened by roasting the rock. Alum shales are found in many formations. For commercial purposes the shale is crushed and spread out for exposure to the weather, or is roasted; but the industry is rapidly dying out, and is not carried on in the United States. An alum shale from England has the composition: silica, 51.16; iron sulphide, 8.50; iron protoxide, 6.11; alumina, 18.30; lime, 2.15; magnesia, .90; sulphuric acid, 2.5; carbon, 8.29; water, 2.00; total, 99.91.

AL′UNITE. A hydrated aluminum and potassium sulphate that crystallizes in the hexagonal system. In color it is usually white, although gray and reddish varieties are sometimes found. It occurs in seams in trachytic and allied rocks, where it has been formed as the result of the action of sulphurous vapors on the rock. This mineral, which is used as a source of alum, is found at Tolfa and Montioni in Italy, in Hungary, and elsewhere in Europe; also at various localities in the United States, especially in Custer County, Colo.

ALUNNO, ȧ-lo͞on′nō, Niccolò (c. 1430-1502), properly called Niccolò da Foligno from his native town, or Niccolò di Liberatore after his father. An Italian painter of the Early Renaissance, the founder of the Umbrian school. He was born at Foligno, was a pupil of Benozzo Gozzoli, and was at a later period influenced by Carlo Crivelli. As the first to reveal fully the emotional Umbrian temperament, in its strange combination of passion and mysticism, he may be termed founder of the school which culminated in Raphael. He had good feeling for line and color, and some skill in rendering movement. His principal works include an "Enthroned Madonna" (1465) in the Brera, which has seven other paintings by him, and his largest altarpiece, a polyptych representing the "Coronation of the Virgin" (1466) in the Vatican. Others are a processional standard representing the "Annunciation" (1466) in the Pinacoteca of Perugia; a panel in two compartments at Karlsruhe; altar-pieces at Gualdo-Tadini (1471) and in the Villa Albani, Rome; and a triptych in the cathedral of Assisi, of noble yet free composition. In his native town there are four paintings by him. From an inscription on one of them, the altar-piece of San Niccolò, "Nicolaus Alumnus Fulginiæ," i. e., "Nicholas, a native of Foligno," Vasari erroneously christened him Alunno, by which name he is generally known.

AL′URED. See Alfred of Beverley.

ALUTA, ȧ-lo͞o′tȧ, or Alt or Olt. An affluent of the Danube rising in the Carpathians, in Transylvania. After entering Rumania through the so-called Red Tower Pass of the Transylvanian Alps, it joins the Danube near Nicopolis (Map: Turkey in Europe, E 2). It is about 340 miles long, and unfit for navigation on account of its rapidity.

ALVA, äl′vȧ, or **ALBA,** Fernando Alvarez de Toledo, Duke of (1508-82 or -83). A Spanish general and statesman. His family was one of the most distinguished in Spain. He was trained by his grandfather for war and politics, entered upon a life of brilliant and intense activity, and became Prime Minister, and general of the armies of Spain under Charles V. and Philip II. As a young man he founght in the campaigns of Charles V. against Francis I., but his military talent was not thought highly of, and this hurt his pride. His appointment to high command was attributed to favor and influence rather than his ability. He was in the campaign against the Elector John Frederick of Saxony, over whom he gained a brilliant victory at Mühlberg in 1547, and fought against Henry II. of France, and in the Italian campaign of 1555 against the combined French and Papal forces, when he overran the States of the Church, but was instructed by Philip II., after the abdication of Charles V., to give up his conquests. He acted as proxy for Philip at the French court when the Spanish king espoused Elizabeth, daughter of Henry II. of France, after the peace of Cateau-Cambrésis in 1559. Alva is best known for his work in the Netherlands, where he was sent in 1567, with unlimited authority to repress the Dutch revolt against Spanish tyranny and the Inquisition. He promptly established the tribunal which has been known as the "Bloody Council." This body, without legal status or procedure, entered upon a general proscription of the living and the dead and the confiscation of property. Excessive taxation brought commerce almost to a standstill, and more than 120,000 Protestants emigrated. Counts Egmont and Hoorne were executed. Prince Louis of Orange was defeated, and Prince William was driven into Germany, after which Alva made a triumphal entry into Brussels, December 22, 1568. He was especially honored by the Pope, and set up in Antwerp a statue of himself trampling on two figures, representing the nobles and people of the Netherlands. His bloodthirsty tyranny intensified the resistance of the Dutch, and after the destruction of his fleet the King recalled him at his own request (1573). He claimed to have caused the execution of 18,000 men. He was received in Madrid with the highest honors, but for an act of disobedience was banished from the court until called upon to conduct a campaign (1580) against Dom Antonio, of Portugal. The country was conquered and treated with that cruelty and license which always followed Alva's course. Alva was tall, spare, bronzed, with a long beard, a typical Spanish grandee. Motley's estimate, severe as it is, represents the world's verdict upon him: "Such an amount of stealth and ferocity, of patient vindictiveness, and universal bloodthirstiness has never been found in a savage beast of the forest, and but rarely in a human being." The German historian, Ludwig Häusser, calls Alva "the hangman of the Netherlands." Consult: J. L. Motley, *Rise of the Dutch Republic* (New York, 1836); Rustant, *Historia de Don Fernando Alvarez de Toledo, duque de Alva* (Madrid, 1751).

ALVARADO, ăl'vä-rä'dō. A seaport in the State of Vera Cruz, Mexico, at the mouth of the Alvarado River, 40 miles southeast of Vera Cruz (Map: Mexico, L 8). The harbor is well sheltered, but is too shallow for vessels of more than 13 feet draught, and the climate is very unhealthful because of the surrounding swamps. Its exports are rice and cacao. Pop., about 4000.

ALVARADO, Alonzo or Alfonso de (?—1554). A Spanish soldier of the sixteenth century. He was born at Burgos, served under Cortes in the conquest of Mexico, and under Pizarro in that of Peru. In 1537 he was sent to Chile against the rebel Almagro, but at the Abancay River was defeated by Orgoñez. In 1548, under Gasca, he assisted in suppressing the revolt of Gonzalo Pizarro. He was appointed Captain-General of La Plata and Potosí, but was vanquished by the malcontent Giron in 1554, and died not long after.

ALVARADO, Pedro de (? — 1541). A Spanish adventurer, a companion of Cortes, and afterward conqueror of Guatemala. He was born at Badajoz, in Spanish Estremadura. In 1517 or 1518, he sailed for the New World, and in the latter year was dispatched from Cuba, by Velasquez, the governor of that island, to explore, under the command of Grijalva, the shores of the American continent, when for the first time the Spaniards heard of the riches of Montezuma, and of his vast empire. In February, 1519, Alvarado sailed with Cortes from Havana for the conquest of Mexico, in which Alvarado played a part second only to Cortes. His blue eyes and blond beard strengthened the impression among the dusky Aztecs that the invaders were "children of the sun," descendants of Quetzlcoatl, who were looked for to resume the dominion of the ancient royal house in Mexico. While he held the city of Mexico, during the absence of his chief, he massacred in the midst of a fête a great number of Aztec nobles. In the night retreat of July 1, 1520, the *noche triste*, Alvarado commanded the rear-guard, and saved his life by a famous leap, the "salto de Alvarado," which he accomplished with the aid of his long spear across a wide breach in the causeway along which the retreating Spaniards were being driven. After the conquest of Mexico, he was sent, in 1523, to subdue the tribes on the coast of the Pacific in the direction of Guatemala. He was completely successful, and returned to Spain, where the Emperor Charles V. appointed him Governor of Guatemala. Pizarro and Almagro were then prosecuting a brilliant career of conquest in South America. Alvarado did not intend to intrude on their territories, but as he considered the province of Quito to be without the limits of these, he landed with a force of five hundred soldiers at Bahía de los Caraques, whence he penetrated into the heart of the country, crossing the Andes by a bold and hazardous march. In the plain of Rio Bamba, he was met by some of the troops of Pizarro, headed by Almagro, and agreed to retire on receiving an indemnity. Subsequently he received the government of Honduras in addition to Guatemala. He perished in an affray with the Indians near Guadalajara in western Mexico in 1541, crushed under his fallen horse.

ALVAREZ, àl'vä'rä', Albert Raymond (1860—). A French vocalist. He was born at Bordeaux. He was first in the army as a musical conductor; afterward he studied at the Conservatoire, Paris, and appeared as an operatic tenor. He first sang at the Paris Opéra in 1892, and soon became the leading tenor of the Opéra. In 1893 he appeared in Covent Garden, London. He visited the United States in 1898-99 and 1900. The unanimous approval with which he met in Europe was not wholly confirmed in this country. His répertoire includes no less than forty-five operas, in eleven of which he created the principal parts.

ALVAREZ, àl-vä'rĕth, José (1768-1827). A Spanish sculptor. He was born April 23, 1768, at Priego, in the province of Cordova. During his youth he labored with his father, a stone mason, and when twenty years old began to study drawing and sculpture in the Academy of Granada. His early essays in sculpture soon attracted attention, and in 1794 he was received into the Academy of San Fernando, at Madrid, where, in 1799, he gained the first prize in the first class. A royal pension having enabled him to pursue his studies at Paris, he gained the second prize for sculpture in the Institute, and in 1804 increased his celebrity by a plaster model of Ganymede, which proved that he could rival Canova in gracefulness of style. Having removed to Rome, he was employed by Napoleon to design bas-reliefs for the Quirinal Palace on Monte Cavallo; but on account of political changes, his works were not allowed to occupy the places for which they had been destined. In Rome, where he lived on terms of friendship with Canova and Thorwaldsen, he executed, among other works, his colossal group, now in the Royal Museum of Madrid, representing a scene in the defense of Saragossa. This work alone is sufficient to establish Alvarez's fame. Clearness of design, dignified simplicity in execution, trueness to nature, and deep sentiment mark the sculptures of Alvarez, who, next to nature and classical antiquity, studied most the works of Michelangelo. He died in Madrid, November 26, 1827.

ALVAREZ, Juan (1780-1867). A Mexican general of Indian descent. He instigated the revolt which deposed Santa Anna (q.v.) in July, 1855, and succeeded Carrera as President in September, but, through the dissatisfaction of the clergy and army, he resigned before the end of the year. He was afterward one of the most determined opponents of Maximilian (q.v.).

ALVARY, àl-vä'rē, Max (1858-98). The stage name of a famous German dramatic tenor. He was born at Düsseldorf; his father was an eminent landscape painter, Andreas Achenbach. He studied singing with Lamperti and Julius Stockhausen of Frankfort, but owing to his father's opposition to his going on the stage, did not make his début until 1882, at Weimar, in *Stradella*. He came to this country in 1884, and made his first appearance as José in *Carmen* at the Metropolitan Opera House, New York. During his five years' engagement here he developed, partly under Seidl's guidance, into a Wagner singer, his finest rôles being Loge, in

Das Rheingold, and Siegfried, in the music drama of that title. Alvary returned to America for the season of 1894-95, and again in 1896. March 21, 1895, at the Metropolitan Opera House, he sang *Siegfried* for the one hundreth time. In November, 1896, he was afflicted with cancer of the stomach, resulting, it is supposed, from bruises received by a fall through an open trap on the Mannheim stage. He went to his beautiful country seat, Datenberg, the building of which, and his enforced absence from the stage, had impoverished him. Here he died, Nov. 8, 1898.

ALVENSLEBEN, äl'vĕns-lā'ben, KONSTANTIN VON (1809-92). A Prussian general; born in Prussian Saxony, was trained in the cadet corps, served through the Danish War and the war with Austria, and commanded the third army corps in the Franco-German War. He retired in 1873. One of the forts at Metz was named for him.

ALVERSTONE, LORD. See WEBSTER, SIR RICHARD.

ALVIN, ål'văɴ', LOUIS JOSEPH (1806-87). A Belgian poet and art critic. He was born at Cambrai; in 1830 was appointed secretary, and subsequently chief of division in the ministry of education. In 1850 he was appointed librarian of the Royal Library, Brussels. He was a member of the Belgian Academy (elected 1845), and, besides numerous contributions to periodicals, wrote a variety of works, including a tragedy, *Sardanapale* (1834); the comedy *Le folliculaire anonyme* (1835); the satire *Les recontemplations* (1856), and the two studies, *Les académies et les autres écoles de dessin de la Belgique en 1864* (1866), and *André von Hasselt* (1877).

ALVINCZY, ŏl'vĭn-tsĕ, JOSEPH, BARON VON (1735-1810). An Austrian field-marshal. He fought in the Seven Years' War at Torgau and Teplitz, and in 1789 he led the force which unsuccessfully attempted to capture Belgrade by storm. Between 1790 and 1793 he fought bravely in the Netherlands. Though oftener losing than winning, he was selected to lead the Austrian army against Bonaparte; but having lost the important battles of Arcola and Rivoli, he was recalled. In 1798 he received the chief command in Hungary, and reorganized the army. He became field-marshal in 1808.

AL'VIS (All-wise). In Norse mythology, the dwarf, a suitor for the hand of Thor's daughter, who answers Thor's questions in the lay (song) of Alvis.

AL'VORD, BENJAMIN (1813-84). An American soldier and writer. He was born at Rutland, Vt., and graduated at West Point in 1833. After serving in the second Seminole War (1835-37), he participated in the War with Mexico, and attained the brevet rank of major. During the march from Vera Cruz to Mexico he was chief of staff to Major Lally's column. He was paymaster of the Department of Oregon from 1854 to 1862, and brigadier-general of volunteers from 1862 until his resignation of this grade in 1865. He was paymaster at New York City till 1867, then in the district of Omaha, Neb., till 1872, and paymaster-general from 1876 until his retirement in 1881. Among his publications are: *Tangencies of Circles and of Spheres* (1855), and *The Interpretation of Imaginery Roots in Questions of Maxima and Minima* (1860).

ALVORD, CORYDON A. (1812-74). An American printer. He was born at Winchester, Conn., and in 1845 removed to New York, where he became widely known as a printer of illustrated books. His establishment on Vandewater Street was one of the largest in the country. It contained fonts of old-style type and of ancient and Oriental letters which enabled him to make remarkable *fac-similes* of old texts. After retiring from business in 1871 he removed to Hartford, where he prepared a history of Hartford and Winchester.

ALVORD, HENRY ELIJAH (1844-1905). An American agriculturist and authority on dairy matters, widely known as a writer and public speaker, and for many years prominently identified with agricultural education and experimentation. He was successively manager of the Houghton Farm Experiment Station, professor of agriculture in several of the agricultural colleges, and president of the Maryland Agricultural College. He organized the Dairy Division of the United States Department of Agriculture in 1895, and remained its chief to his death.

ALWAR, äl'wär. A feudatory State of Rajputana (q.v.), British India (Map: India, C 3).

ALWAR. Capital of the native Rajputana State of the same name, India, on the North-Western Railway, 60 miles northeast of Jaipur. It is the residence of the Maharaja and of a British political agent. The town, dominated by an imposing fort, built on a rock 1200 feet high, is picturesquely situated on undulating ground. Its chief building is the Royal Palace. Other noteworthy features are temples and tombs, and churches of the Roman Catholic and Presbyterian missions. It has a fine water supply from the artificial Siliser Lake, nine miles southwest of the city. Pop., 1891, 52,398; 1901, 56,740.

AL'WATO. See ANDREWS, STEPHEN PEARL.

ALYATTES, ăl'ĭ-ăt'tēz (Gk. Ἀλυάττης). A king of Lydia, who ascended the throne about 618 B.C. He took Smyrna, drove the Cimmerians from Asia, and attacked Clazomenæ, but was repulsed. A six years' war was waged between him and Cyaxares, King of Media. He died about 562 B.C., and was succeeded by his son, the historic Crœsus. His tomb, not far from Lake Gygæa, was one of the wonders of antiquity.

ALYS'SUM (Gk. ἄλυσσον, *alysson*, a plant used to check hiccough, from ἀ, *a*, neg. + λύζειν, *lyzein*, to hiccough). A genus of low-growing mostly perennial plants of the natural order Cruciferæ. There are many species and cultivated varieties, mostly of European origin. The flowers are small, white or yellow, and borne in racemes. The sweet alyssum (*Alyssum maritimum*), grown in low borders, window gardens, and baskets, and fenced in greenhouses, is an annual.

ALZEY, äl'tsī. An old city in Rhenish Hesse, on the Selz, 18 miles southwest of Mainz (Map: Prussia, C 4). Its chief industries are the manufacture of shoes, leather ware, and furniture. Population in 1890, about 6000; in 1900, 6900. It was known in the fourth century, and was built on the site of an earlier Roman settlement. Volker the Fiddler, a hero of the *Nibelungenlied*, is supposed to have come from Alzey.

ALZOG, äl'tsôɢ, JOHANN BAPTIST (1808-78). A Roman Catholic theologian. He was born at Ohlau, Silesia, June 29, 1808, and was professor of church history in the University of Freiburg from 1853 till his death there, March 1, 1878.

He wrote a *Manual of Universal Church History*, which is known in many languages (original, Mainz, 1840; tenth edition by F. X. Kraus, 1882, 2 volumes; English translation, Cincinnati, Ohio, 1874-76, 3 volumes); also *Grundriss der Patrologie oder der ältern christlichen Litterargeschichte* (Freiburg, 1866; fourth edition, 1888). He was, in 1869, a member of the commission on dogma which prepared the work for the Vatican Council, and was the only member of the commission who opposed the promulgation of the dogma of Papal infallibility. He concurred in it, however, after its adoption.

AM'ADAS, or **AM'IDAS**, Philip (1550-1618). An English navigator. He was born in Hull, England. Sir Walter Ralegh selected him as captain of one of the two ships sent out in 1584 to find a suitable place on the coast of North America for planting a colony. He and Barlow, captain of the other vessel, coasted northeasterly from the vicinity of Cape Fear and reached Ocracoke Inlet (July 13). They landed on the narrow island separating Pamlico Sound from the Atlantic, and afterward visited the Indians on Roanoke Island. They returned to England and gave a glowing account of the country, Barlow writing the report. Several years afterward Amadas conducted an expedition to Newfoundland. Consult Hakluyt, *Principall Voiages*, new edition, Volume III. (London, 1809-12).

AMADEO, ä'mȧ-dā'ō, Giovanni Antonio (c. 1447-1552). An Italian sculptor and architect. He was born at Pavia, where he executed a portion of the façade decorations of the Carthusian monastery. His most important work is generally considered to be the Colleoni Chapel, Bergamo, with its bas-reliefs and statuary. From 1490 to 1519 he conducted the work upon the Milan Cathedral. He sought to combine the respective styles of the Middle Ages and the early Renaissance, and ranks as the most important of Lombard sculptors.

AM'ADE'US. A name borne by several members of the House of Savoy (q.v.), including one king of Spain. See Amadeus I.

AMADEUS I., Ferdinand Maria (1845-90). Duke of Aosta and King of Spain. He was the second son of Victor Emmanuel of Italy, and was rear-admiral in the Italian navy and lieutenant-general in the army. He married Princess Maria del Pozzo della Cisterna, daughter of the Countess de Merode, May 30, 1867. On November 16, 1870, the Cortes of Spain elected him king, and on December 4 Amadeus accepted the crown, with the sanction of his father and the approval of the great Powers. He reached Madrid January 2, 1871, four days after the assassination of General Prim. He himself was attacked by assassins in July, 1872. In the same year a great Carlist rising took place. On February 11, 1873, he abdicated for himself and his heirs, and returned to Italy, the Spanish Cortes proclaiming the Republic, and making Figueras provisional President. Consult Whitehouse, *The Sacrifice of a Throne* (New York, 1897).

AMADEUS VIII. See under Felix.

AM'ADIS OF GAUL. A legendary hero of the most famous of mediæval romances, which even the barber of Don Quixote had not the heart to consign to the flames. It was the centre and parent of a cycle of similar tales of chivalry which have their representatives in every literary language of mediæval Europe, and even in Hebrew. In what language it was first written is uncertain. Portugal, Spain, France, and England claimed its nativity, and, with the exception of Portugal, all with some show of justice. Amadis owes its inspiration to the Arthurian cycle, and so to Britain. It appears to have been developed in northern France, the home of the mediæval epic, to have migrated thence to Provence, and to have been carried by the troubadours, either as a complete story or as a tradition, to Spain, where we find the epic mentioned by poets in the middle of the fourteenth century in a way to indicate that it was already widely popular there, though no contemporaneous trace of it has been found in Italy. (Consult Braunfels, *Kritischer Versuch über den Roman Amadis von Gaula*, Leipzig, 1876.) The earliest surviving Amadis legend is by the Spaniard Garcia Ordoñez de Montalvo, and appears to have been finished about 1470. He allowed himself considerable liberties with the tradition, especially toward the close, and his anonymous successors extended the romance to twelve books and more than three times the length he had given it. It was first printed in 1519, and so fully embodies the taste of the generation that had given it birth that it almost immediately became part and parcel of the literary consciousness of Europe, each nation recognizing and reclaiming its share in it, although they claimed no part of the continuation by Montalvo, in which he described, out of his own invention, the deeds of the son of Amadis, Esplandian. Amadis was rendered into Italian in 1546, and into German before the end of the century. It attracted the attention of Francis I. during his captivity at Madrid, and at his command was translated by Nicolas de Herberay, who rendered two-thirds of the Spanish epic into polished French, finishing his work in 1548. Ten translations followed this, with supplementary adventures and imitations, till the whole swelled at last to twenty-five books, detailing the adventures of an entire family. In its simpler form it tells how its hero, Amadis, the illegitimate son of Perion, King of Gaul, and Elisena, a princess of Brittany, was placed by his mother in a river in a box, was rescued at sea by a Scottish knight, and educated at the Scottish court, was enamored of Oriana, daughter of King Lisuarte of England, married her, returned to Gaul, and spent the rest of his life, there and elsewhere, in manifold adventures. Both the French and the Spanish Amadis were criticised in their own day for defective structure, hyperbolic phantasy, immorality, and irreligion. Their popularity lasted until they themselves had raised up worthier imitators of their example. The first of these was d'Urfe's *Astrée*.

An English version of Amadis, much shortened to its advantage, was made by Southey (London, 1803). For the origin of the story, consult: Grässe, *Litteraturgeschichte* (Dresden, 1844-50); and Körting, *Geschichte des französischen Romans im XVII. Jahrhundert* (Leipzig, 1885): for further bibliography, Braga, *Grundriss der romanischen Philologie* (Strassburg, 1893).

AMADIS OF GREECE. A supplement to *Amadis of Gaul*, a Spanish work by Feliciano da Silva. It is noteworthy as being perhaps the source of Florizel in Shakespeare's "Winter's

Tale," and of the "Masque of Cupid," in Spenser's *Faerie Queene*.

AMADOR, ä'mȧ-dōr', Manuel (1833—). First president of the Republic of Panama. He was formerly connected with the French diplomatic service in Panama, and had some military training. He was elected president of Panama February 17, 1904, and three days afterward was inaugurated to hold office for four years.

AMADOR DE LOS RIOS, ä'mȧ-dōr' dā lōs rē'ōs, José (1818-78). A Spanish critic and historian, born at Baena. He first became known as editor (with Madrazzo) of the collection entitled *Monumentos arquitectónicos de España*. His most noted work is the *Historia de la literatura española* (1861-65), of which he completed but seven volumes. Despite many defects resulting from its scope and complexity, this work remains standard in the subject of which it treats. His other publications include works on the art monuments of Toledo and Seville, a history of Latin-Byzantine art in Spain, and the exhaustive *Historia social, política y religiosa de los judíos de España y Portugal* (Madrid, 1875-76).

AMADOU, ăm'ȧ-dōō' (Fr. tinder, from *amadouer*, to bait, allure, coax, alluding to its use as tinder during the Middle Ages). A name given to some fungi of the genus Polyporus. They grow upon old trees, especially oak and ash, in Great Britain and on the continent of Europe. The pileus is completely blended with the hymenium, which is pierced with thin-sided, rather angular, tubular, vertical passages—the whole fungus thus appearing as a leathery or fleshy mass, the under side of which is pierced by deep pores. Polyporus igniarius is called Hard amadou, or Touchwood. Polyporus fomentarius is called Soft Amadou, or German Tinder. They are used as styptics for stanching slight wounds; and when steel and flint were in general use for striking fire, were much employed as tinder. The soft amadou is used for making small surgical pads, for which its elasticity peculiarly fits it. The remarkably light wood of Hernandia Guianensis, a shrub of the natural order Thymelæaceæ, is readily kindled by flint and steel, and is used as amadou in Guiana.

AMAGER, ä-mä'gẽr. An island in the district of Copenhagen, Denmark; it is in the Sound, and separated from Zealand by the Kalvebod Strand (Map: Denmark, F 3). Amager has an area of 25 square miles. Christianshavn, at the northern end of the island, forms part of the city of Copenhagen. The chief trade is market gardening for Copenhagen. The shipping of the island is of some importance. The inhabitants are chiefly descendants of Dutch emigrants of the sixteenth century, who still preserve their old dress and customs. Pop., 1900, 25,000.

AMAI'MON, or **AMOY'MON** (Probably Gk. ἀ, *a* priv. + Heb. *maimin*, believer). A demon named in the theory of the Middle Ages as king of the eastern part of hell. Asmodeus (q.v.), the demon of desire, was his lieutenant. See allusions in Shakespeare's *Merry Wives of Windsor*, II., 2, and *Henry IV.*, first part, II., 4.

AMAL'ARIC (502-531). The last Visigothic King of Spain (526-531). He married Clotilda, daughter of Clovis, King of the Franks, in 527, and treated her so badly because she would not embrace Arianism that her brother Childebert marched against him and defeated him. According to Gregory of Tours, Amalaric was killed in the battle; according to others, he was killed at Barcelona.

AM'ALASUN'THA (?-535). Queen of the Ostrogoths, daughter of Theodoric the Great. On the death of Theodoric, her son Athalaric succeeded under the regency of Amalasuntha. She was well educated, and preferred the Roman civilization. The Goths, who were opposed to this, incited her son to rebellion in 533. Amalasuntha subdued the rebellion, and Athalaric died the following year, at the age of eighteen. She then associated Theodahad with her in the kingdom, but did not marry him. In 535 Theodahad murdered Amalasuntha, under the pretext that she was planning to betray the Goths to Justinian. Her actions had made it probable that she was thinking of retiring to Constantinople. Belisarius avenged her death by killing Theodahad in 536. Consult Hodgkin, *Italy and Her Invaders*, Volumes III. and IV., second edition (Oxford, 1896). See Goths.

AMAL'ECITE. An Algonkian tribe, closely related to the Abnaki, and scattered over western New Brunswick, chiefly along the St. John River, to the number of about 850. The name, frequently written Malisit, has been variously rendered "disfigured foot" and "broken talkers." Together with the more eastern bands of the Abnaki, they were sometimes known as Etchemin. In the colonial wars they took the French side.

AM'ALEKITES. One of the fiercest and most warlike of the old nomadic Arabian tribes. They dwelt in the land south of Judea (Numbers xiii : 29), between Idumea and Egypt, though it would also appear that a branch extended at one time into central Palestine. Their country is first mentioned in Genesis xiv as the scene of the wars of Chedorlaomer of Elam. From the very first they manifested great hostility to the Israelites, attacking them at Rephidim during the journey toward Sinai. They were defeated in this encounter (Exodus xvii : 8-16), and their complete extermination was prophesied (*ib.*, Numbers xxiv : 20; Deuteronomy xxv : 17-19). When Israel was attempting to enter Palestine, the Amalekites led the opposing Canaanitish forces (Numbers xiv : 43-45). In the days of Saul they were almost annihilated (I. Samuel xv : 2); and later David overcame a band of marauding Amalekites with great slaughter, pursuing them until "there escaped not a man of them save 400 young men who had camels and fled" (I. Samuel xxx : 1-20). The last Amalekites were finally extirpated in the days of Hezekiah by the Simeonites (I. Chronicles iv : 43). The inveterate hostility between Amalek and Israel is reflected in so late a production as the Book of Esther, where the designation of Haman, the arch-enemy of the Jews, as "the Agagite" (Esther iii : 1), is introduced in order to emphasize his descent from Agag, the King of Amalek (Numbers xxiv : 7).

AMALFI, ȧ-mäl'fē. A seaport town in Campania, southern Italy, situated on the Gulf of Salerno, about 22 miles southeast of Naples. It is situated on the slope of a mountain rising from the coast and covered with splendid trees and gardens. The houses tower one above another, and are connected by stairways and bridges. The most interesting building of the place is the old cathedral, with its bronze doors cast in Constantinople in the eleventh century, and its columns from Pæstum. An old Capuchin monastery, dating from the beginning of the thirteenth century, is finely situated west of Amalfi in the hollow of a rock rising about 230 feet from the sea. The town produces paper, soap, and macaroni. It is connected by steamer with Naples and Messina. Pop., 1901, 7300. According to local tradition, Amalfi was founded by Constantine the Great. From the ninth to the eleventh century it was an independent State, and was ruled by doges. It had a large population, and enjoyed a considerable trade with the Orient. Amalfi carried on a long struggle with the Pisans and the neighboring princes of Salerno. One of the oldest maritime codes, the *Tabula Amalphitana*, was compiled in Amalfi, and the town is otherwise famous as being the birthplace of Flavio Gioja and of Masaniello.

AMAL′GAM (Lat. Gk. *μάλαγμα*, *malagma*, an emollient, plaster, from *μαλακός*, *malakos*, soft). An alloy of mercury with one or more other metals. An amalgam of silver crystallizing in the isometric system has been found native; a gold amalgam, too, has been reported from several localities, including California. Artificially, amalgams are made (1) by bringing metallic mercury into contact with another metal, as antimony, arsenic, bismuth, etc.; (2) by bringing mercury into contact with a saturated solution of a salt of the other metal, when part of the mercury goes into solution and the remainder combines with the liberated metal, which is the case with calcium, iron, and certain other metals; (3) by placing the metal to be amalgamated in a solution of a salt of mercury, which is the usual method for amalgamating copper and aluminum; finally (4) by placing the metal to be amalgamated in contact with mercury and dilute acids.

Amalgams may be either solid or liquid. Those which are liquid are regarded as solutions in which there is an excess of mercury. The more important amalgams are as follows: Copper amalgam, which is made by triturating finely divided metallic copper with mercurous sulphate under hot water. This amalgam has the property of softening when kneaded, and becoming quite hard after standing some hours, which has led to its use for filling teeth. Gold amalgam is formed by heating mercury with powdered gold or gold foil. The readiness with which mercury combines with gold has been made the basis of an important process for the extraction of the latter from ores. After the ore or the gold quartz has been stamped to fine powder, the powder is brought in contact with mercury. The gold readily unites with the mercury, forming an amalgam, which is then placed in a retort, from which the mercury is expelled by heating, and may be collected for further use, while the gold remains in the retort. Silver amalgam is formed by the union of mercury with finely divided silver, and this fact is taken advantage of for the extraction of silver from its ores by a process analogous to that described in connection with gold amalgam. An amalgam consisting of 8 parts of mercury to 1 part of silver is used for silvering metals. Mercury readily combines with sodium when the two elements are brought in contact with each other, yielding an amalgam which is largely used by chemists as a reducing agent. Tin amalgam is formed when mercury is brought in contact with tin in the proportions of 3 parts of the former to 1 part of the latter. This amalgam is the one commonly used for silvering mirrors. Zinc amalgam results when zinc filings are mixed with mercury at a heat somewhat below the boiling point of the latter. It is used for coating the rubbers of electric machines. Amalgams of bismuth, cadmium, magnesium, potassium, and other metals are known, but have no important commercial uses. Consult Dudley, "An Index to the Literature of Amalgams," in *Proceedings of the American Association for the Advancement of Science* (Salem, 1889).

AMAL′GAMA′TION. See GALVANIC BATTERY.

AMALIA, ȧ-mä′lē-ȧ, ANNA (1739-1807). The wife of Duke Ernest Augustus of Saxe-Weimar-Eisenach. She was born at Wolfenbüttel. On the death of her husband, in 1758, she was appointed Regent for her infant son, Karl August, whom, aided by his tutor, Wieland, she trained in the love of literature and art, also doing much to foster education and material prosperity throughout his domains. Soon after assuming the government, the Duke, with his mother's active coöperation, gathered at Weimar a galaxy of literary talent probably never equaled. Goethe, Herder, and Schiller were its brightest stars, but they shone in goodly company. Weimar continued during and beyond her life what she, more than any other, had made it, the literary centre of Germany. She died at Weimar, April 10, 1807. Consult Gerard, *A Grand Duchess, The Life of Anna Amalia, and the Classical Circle of Weimar* (New York, 1902).

AMALIE, ȧ′mȧ′lē′, MARIE, or MARIE AMÉLIE (1782-1866). The wife of Louis Philippe, King of the French. She was the daughter of King Ferdinand I. (IV). of the Two Sicilies. When she married Louis Philippe (then Duke of Orleans), he was a political exile, without hope of ever rising to the throne of France. Amalie never interfered in politics, and possessing all the domestic virtues, was happy with her husband. She shared his fortunes in exile, and was received in England with the respect due her.

AMALIE, ȧ-mä′lē-*e*, MARIE FRIEDERIKE (1818-75). Queen of Greece, daughter of Grand Duke Augustus of Oldenburg. She married King Otho of Greece, November 22, 1836, and was much beloved for firmness, benevolence, and many other virtues. After her husband's deposition in 1862 she accompanied him to Bavaria, residing after his death at Bamberg.

AMALIE, MARIE FRIEDERIKE AUGUSTE (1794-1870). A German duchess and dramatist, eldest sister of King John of Saxony. In part under the pseudonym of Amalie Heiter, she published a large number of dramas, some of which have been adapted to the French and English stage. She also wrote operas and sacred music. There is a complete edition of her dramatic works by Waldmüller (6 volumes, 1873-74).

AMAL′RIC OF BÈNE, bān (?-1209). Also called AMAURY OF CHARTRES. The founder of a school of Pantheists known by his name. He was born at Bène, near Chartres. He lectured in Paris upon philosophy and theology about 1200. His doctrines were condemned by the University. Pope Innocent III. confirmed the condemnation (1204) and ordered Amalric to return to Paris and recant, which he did, and so when he died, which was in the same year, he was buried in the consecrated ground of the monastery of St. Martin des Champs, Paris. But when it was discovered that the sect which he had founded had spread throughout France, a synod was called in Paris in 1209, his teaching formally condemned, several of his followers burned at the stake as heretics, and his own body was also dug up, burned, and the ashes thrown to the winds. His doctrines were formally condemned by the fourth Lateran Council in 1215.

AM'ALS, or **AM'ALI**. The royal family of the Ostrogoths, which furnished the sovereigns for about two centuries. The most noted were Theodoric the Great (q.v.), Amalasuntha, and Witigis. The race came to an end in 605, when Germanus Postumus and his daughter were put to death by Phocas. Hodgkin, in *Italy and Her Invaders*, Volume III. (Oxford, 1896), gives a genealogical table of the Amals.

AM'ALTHE'A (Gk. *'Αμάλθεια, Amaltheia*). A nymph, the nurse of the infant Zeus. The name was transferred to the goat which, according to the Cretan legend, suckled the god, and was rewarded with a place among the stars. The "cornucopia," or horn of plenty, was said to be the horn of the goat Amalthea, which had been broken upon a tree. This horn is really an attribute of all the deities who were believed to control the fruits of the earth. See ÆGIS.

AMA'MA, SIXTINUS (1593-1629). A Dutch Orientalist. He was born at Franeker, Friesland, studied Oriental languages at the University there, and subsequently at Exeter College, Oxford. He succeeded Drusius as professor of Hebrew at Franeker. In 1625 he was called to Leyden, but the Estates of Friesland refused to permit him to go. He was among the first to advocate a thorough knowledge of the original languages of the Bible as indispensable to theologians. His works include *Dissertatio qua Ostenditur Præcipuos Papismi Errores ex Ignorantia Hebraismi Ortum Sumpsisse* (1618), *Censura Vulgatæ Versionis V. Librorum Mosis* (1620), and a *Hebreeuwsch Woordenboek* (1628).

AMANA, ăm'ȧ-nȧ. A German religious community established at Amana, Ia., comprising several villages of settlers situated a few miles apart under the government of a president and thirteen directors, elected annually by the community. Family life is preserved, but meals are provided for a number of families together. Woolen mills, flour mills, saw mills, dye-shops, and agriculture are the chief industries operated in common for the benefit of all. Life is simple, and all necessaries are furnished freely to members of the community. New members are elected after a probationary period. Daily prayer-meetings are held. The sect was founded by Eberhard Gruber in Württemberg, Germany, 1714, and came to America, 1843, settling first in western New York and moving to Amana, 1855-64. The community in 1905 numbered about 1800 persons, and owned 26,000 acres of land, their total property being valued at $1,500,000. See COMMUNISM and COMMUNISTIC SOCIETIES.

AMAN'DA. In Cibber's comedy, *Love's Last Shift*, and Vanbrugh's *The Relapse* (from which Sheridan made *A Trip to Scarborough*), the faithful and charming wife of Loveless, who has basely deserted her, but is finally won back by the sense of her fidelity.

AMANDE DE TERRE, ȧ'mäɴd' de târ'. The French name for *Cyperus esculentus*. See CHUFA.

AM'ANI'TA (Gk. nom. pl. *ἀμανῖται, amanitai*, a sort of fungi). A poisonous fungus allied to the genus Agaricus. Amanita muscaria, which is pretty common in woods, especially of fir and beech, in Great Britain, and also in the United States, is one of the most poisonous fungi. It is sometimes called Fly agaric, being used in Sweden and other countries to kill flies and bugs, for which purpose it is steeped in milk. The pileus or cap is of an orange-red color, with white warts, the gills white, and the stem bulbous. It grows to a considerable size. Notwithstanding its very poisonous nature, it is used by the natives of Kamtchatka to produce intoxication. Amanita phalloides, commonly called Death Cup, is quite similar to the fly agaric. It is perfectly white, with white spores, and a ring on the stem. For illustration, see FUNGI, POISONOUS.

AMANTS MAGNIFIQUES, ȧ'mäɴ' mȧ'nyē'fēk' (Fr., magnificent lovers). A prose comedy in five acts by Molière, written by order of Louis XIV. in 1670. The two lovers are princely rivals, who give various entertainments and ballets for which the slender plot is made the occasion.

AMAPALA, ȧ-mä'pȧ-lȧ. A free port of Honduras, situated on the north shore of the island of Tigre, in the Gulf of Fonseca (Map: Central America, D 4). The harbor is very good, capable of containing vessels of the deepest draught, and the town has a healthful climate, so that it gets a good part of the trade of Honduras, San Salvador, and Nicaragua. The chief articles of export are hides and coffee. Gold, silver, and mineral ores were formerly exported in great quantities. The town was founded in 1838, and the opening of the port took place in 1868. Pop., about 3000.

AMARA-KOSA, ȧm'ȧ-rȧ kō'shȧ. See AMARASINHA.

AM'ARANT. A giant slain by the legendary Guy of Warwick (q.v.) in the Holy Land.

AM'ARANTA'CEÆ, AMARANTH FAMILY (For derivation, see AMARANTH). A natural order of dicotyledonous plants, embracing about 500 species. They are widely distributed, but are most abundant in the tropics. In floral characters they greatly resemble the Chenopodiaceæ, differing in some minor particulars and in habit of growth. The general inflorescence is racemose, the auxiliary cymes going to make up a compound inflorescence. In general habit most of the species are rather coarse weeds, although some are grown as ornamentals, such as Cockscomb, Prince's feather, Love-lies-bleeding, etc. The chief genera are Amarantus, Celosia, Gomphrena, and Iresine.

AM'ARANTH (Gk. *ἀμάραντος, amarantos*, from *ἀ, a*, neg. + *μαραίνειν, marainein*, to die away, wither), *Amarantus*. A genus of plants of the natural order Amarantaceæ. This genus contains nearly 100 known species, natives of tropical and temperate countries, but chiefly abounding within the tropics. They are herbs or shrubs, with simple leaves, and flowers in heads or spikes. The genus Amarantus has mostly monœcious flowers. Some of the species are naturally of singular form, and others assume singular but monstrous forms through cultivation. Love-lies-bleeding (*Amarantus caudatus*), Prince's feather (*Amarantus hypochondriacus*), and other species are common annuals in our flower gardens. The spikes of Amarantus caudatus are sometimes several feet in length. The dry red bracts which surround the flower retain their freshness for a long time after being gathered, for which reason the plant has been employed by poets as an emblem of immortality. The Globe amaranth (*Gomphrena globosa*) and the Cockscomb, well known tender annuals, belong to the same natural order. The Globe amaranth is much cultivated in Portugal and other Roman Catholic countries for adorning churches in winter. Its flowers, which are of a shining purple, retain their beauty and freshness for several years. About a dozen species are native and introduced in the United States, where they are mostly coarse annual weeds. Amarantus blitum, Amarantus oleraceus (Chusan han-tsi), and other species are used as potherbs. Wholesome mucilaginous qualities are generally found in the leaves throughout the order. The seeds of Amarantus frumentaceus (called Kiery) and of Amarantus anardana, or Amarantus paniculatus, are gathered for food in India. Medicinal properties are ascribed to some species of the order, particularly to Gomphrena officinalis and Gomphrena macrocephala, which have a high and probably exaggerated reputation in Brazil as cures for many diseases. Consult: L. H. Bailey, *Cyclopædia of American Horticulture* (New York, 1900-02); and G. Nicholson, *The Illustrated History of Gardening* (London, 1888).

AMARAPURA, ŭm'ȧ-rä-pōō'rȧ, or UMMERAPOORA, "City of the Gods." The former capital of Burma, situated on the east bank of the Irrawaddy, and on the Rangoon and Mandalay Railway, nine miles northeast of Ava, in lat. 21° 57′ N., long. 96° 7′ E. It was founded in 1783; in 1810 it was almost totally destroyed by fire, and in 1839 an earthquake laid it in ruins. In 1852-53 it was finally deserted and the capital of the country removed to Mandalay. Nothing remains of the old city save some rows of beautiful trees and interesting ruins of a palace and of several pagodas. A celebrated temple in the suburbs contains a famous colossal bronze image of Gautama (Buddha). The population in 1810 was estimated at 170,000; it has declined to less than 5000.

AM'ARASIN'HA, or **AM'ARA-SIṂ'HA**. A celebrated Sanskrit lexicographer of antiquity, whose vocabulary, *Amara-kośa*, or "Amara's Treasury," formed a storehouse of words in early times, and a mine of information for later workers in the field. This glossator is commonly called simply Amara in the native commentaries; but his title *Siṃha* shows that he belonged to the princely class. Little is known of his life, except that he was a Buddhist in religion, and it is assumed that all his writings, except the dictionary, perished through the persecutions which the Buddhists at one time suffered at the hands of the orthodox Brahmans. There is, however, great uncertainty as to the time when Amara lived. His date has been generally put at about 500 A.D. His name is associated with the poet Kalidasa (q.v.), and the others of the "nine gems" at the court of Vikramaditya in an Augustan Age of Sanskrit literature. The sixth century A.D. is the date most commonly assigned for the reign of this monarch; but the Hindus place him some centuries earlier, a view which there is rather a tendency to follow than to reject. (See KALIDASA.) The real title of Amara's Sanskrit vocabulary is not *Amara-kośa*, but *Nāmaliṅgānuśāsana*, "a book of words and genders." It is also called *Tri-kāṇḍa* or *Tri-kāṇḍi*, i.e. tripartite, from its three books of words and homonyms relating to the world and man and miscellaneous matters. The second of these is the longest, and each book is subdivided into chapters, called *vargas*. The whole work comprises about 1500 verses, generally consisting of lines of sixteen syllables, and the words are arranged, not alphabetically, but, in general, as synonyms according to subject and gender. There are numerous editions of the *Amara-kośa*, accompanied also by the old native commentaries. Mention may be made of the edition with introduction, English notes, and index by Colebrooke (Serampore, 1808). This was reprinted in 1829. A French edition, with translation, was published by Loiseleur-Deslongschamps (2 volumes, Paris, 1839-45). Valuable are the editions by Chintāmani Sāstrī Thatte, under the superintendence of F. Kielhorn (2d edition, Bombay, 1882), and in the collection of Sanskrit ancient lexicons, or Abhidhānasamgraha (Bombay, 1889). Consult Zachariæ, "Die indischen Wörterbücher (Koś'a)," in Bühler's *Grundriss der indo-arischen Philologie und Altertumskunde* (Strassburg, 1897).

AMARI, ȧ-mä'rē, MICHELE (1806-89). An Italian historian and Orientalist. He was born at Palermo. At the age of sixteen he entered a government office, and soon afterward—his father being condemned to thirty years' imprisonment for a political crime—the duty of supporting his mother and the other members of the family devolved upon him. He succeeded, nevertheless, in acquiring an education, learned French and English, and published a translation of *Marmion* in 1832. In 1837 he removed to Naples. In 1841 appeared his masterpiece, *La Guerra del Vespro Siciliano* (*The War of the Sicilian Vespers*), in which the author overthrows the prevalent notion, established by Villani, of the cause of the famous massacre of 1282. The book was quickly prohibited, and, as a consequence, widely read. It was translated into German by Dr. Schröder, of Hildesheim, and into English by Lord Ellesmere. Dreading punishment at Naples, Amari fled to France, where he gave himself up to the study of Arabic and modern Greek, and to the preparation of his *Storia dei Musulmanni di Sicilia* (1854-68). Upon the outbreak of the revolution of 1848, he returned to Italy, and shortly after his arrival was elected vice-president of the committee of war in Sicily. He was next sent on a diplomatic mission by the provisional government to France and England. In 1849 he published at Paris *La Sicile et les Bourbons*, to show up the pretensions of the Neapolitan sovereign. After the Sicilian insurrection had been quelled, Amari took up his residence in Paris, where he devoted himself to literary pursuits till 1859, when he returned to Italy, fighting the following year under Garibaldi. He was made senator in 1861, and in 1862-64 was minister of instruction. He resigned his professorship at Florence in 1878 and removed to Rome, where he continued his historical studies. He died July 16, 1889. Other writings of Amari are upon the language and history of the Arabs, in the *Revue Archéologique*, the *Journal Asiatique*, etc.

AMAR'NA LET'TERS. A collection of more than three hundred letters and dispatches, inscribed upon clay tablets, which were found, in the winter of 1887-88, in the village of Tel-el-Amarna (q.v.) in Middle Egypt. They represent the Asiatic correspondence of the Egyptian court about 1400 B.C., and it is a remarkable fact that they are in the cuneiform character, and, with three exceptions, in the Babylonian language, which would thus appear to have been the medium of diplomatic communication throughout Western Asia. One of the letters is in the language of Mitani, in northern Mesopotamia, and two are in that of Arçapi or Arzaya (probably Cyprus). Among the writers are the Egyptian kings Amenophis III. (q.v.), and Amenophis IV. (q.v.), and the kings of Mitani, of Babylonia, of the Hittites, and of Alashia (Cyprus). It appears from these letters that the Egyptian kings of the eighteenth dynasty intermarried with the royal houses of both Mitani and Babylonia. Amenophis III. married a sister of Kadashman-Bel, King of Babylonia, and also a sister of Dushratta, King of Mitani; while Amenophis IV. married a niece of his father's Mitanian wife. Frequent reference is made to commercial affairs, implying a considerable intercourse between Egypt and the Asiatic states. By far the greater number of the Amarna letters proceed from Egyptian officials and subject allies in Syria, at that time a dependency of Egypt, and afford a valuable insight into the state of Palestine before the Hebrew invasion. The growing weakness of Egypt and the extension of the Hittite dominion in the north can be clearly seen, and the withdrawal of the Egyptian troops gave opportunity for conflicts between the princes of the small city-states into which the land was broken up. To add to the general confusion, the country was threatened on the east by the Khabiri—marauding nomads from the Arabian Desert, whose sphere of activity extended from southern Palestine as far north as Sidon, Beirut, and Gebal. Some scholars are inclined to identify the Khabiri with the Hebrews; but this theory has not met with general approval. The letters of the Palestinian princes, which are full of mutual recriminations, reveal the fact that there were two chief parties; one loyal to Egypt, the other professing loyalty, but in reality allied with the enemies of Egypt and everywhere successful. Among the most zealous supporters of Egypt was the Prince of Jerusalem, at this time a city of some importance. Two letters are written in a curious dialect which has been taken as the oldest known specimen of Indo-Germanic. Consult: Winkler, in *Schraders Keilinschriftliche Bibliothek* (Berlin, 1896); English translation by Metcalfe, *The Tell El Amarna Letters* (New York, 1896); Knudtzen, *Die Zwei Arzawa-Briefe* (Leipzig, 1902).

AM'ARYL'LIDA'CEÆ (THE AMARYLLIS FAMILY). An order of monocotyledonous plants with about 75 genera and nearly 1000 species. The plants resemble those of the Liliaceæ in many respects, except that they all have inferior ovaries. The species are mostly tropical and subtropical, and are generally found in dry regions. Many are bulbous, leafing and flowering only in the wet season, while others have thick fleshy leaves covered with wax or otherwise protected for their xerophytic habit. The inflorescence is usually a scape; the flowers have an inferior three-celled ovary, six stamens, and six petal-like segments to the perianth. In some species, as in Narcissus, a sort of corona is present between the normal perianth and the stamens. The fruit is a capsule or berry. The recent classification by Pax is into Amaryllidoideæ, of which the chief genera are Hæmianthus, Galanthus, Amaryllis, Crinum, and Narcissus; Agavoideæ, with Agave and Fourcroya, the leading genera; Hypoxidoideæ, with Alstrœmeria, Bomaria and Anigozanthus; and Campynematoideæ, represented by Campynema. Some of these are of great economic value (see AGAVE; HEMP, SISAL), while many others are extensively cultivated as ornamentals. See NARCISSUS; AMARYLLIS; BLOOD FLOWER; ALSTRŒMERIA; GALANTHUS, etc.

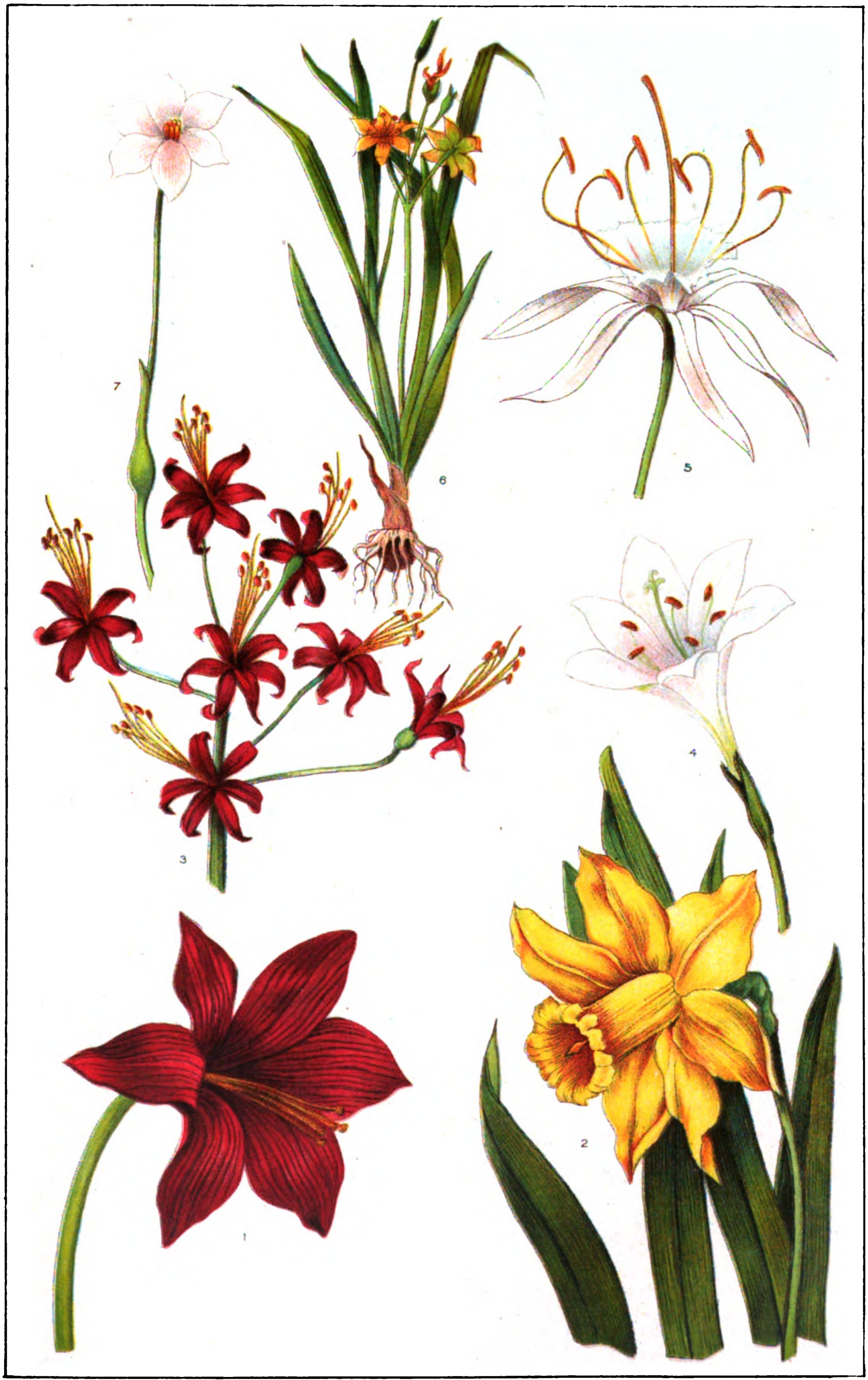
AM'ARYL'LIS (from the famous nymph *Amaryllis*). A genus of bulbous-rooted plants of the natural order Amaryllidaceæ, having a simple six-partite perianth, and containing a large number of species, natives of the warmer regions of the globe. Many of them have flowers of very great beauty. Many of the species formerly grouped under Amaryllis have been separated into different genera, of which Amaryllis, Nerine, Hippeastrum and Brunisvigia are the best known. A species of this genus, Amaryllis formosissima, was brought to Europe from South America in the end of the seventeenth century, and has since been in common cultivation as a garden flower. Its scentless flowers are of a beautiful red color, exhibiting a play of golden gleams in the sunshine. Amaryllis belladonna, known also as a Belladonna Lily, has a scape 1-3 feet high, bearing an umbel of rose-colored fragrant flowers. Amaryllis amabilis, Amaryllis josephinæ, and Amaryllis vittata are among the most admired bulbous-rooted plants. Amaryllis sarniensis is one of the most hardy species, flowering freely in Guernsey, with a little protection during winter, and although commonly called Guernsey Lily, it is supposed to be a native of Japan. By artificial impregnation, a great number of hybrid forms have been produced in this genus. Consult J. G. Baker, *Handbook of the Amaryllidæ* (London, 1888).

AMARYLLIS. A shepherdess in the *Idyls* of Theocritus and in Vergil's *Eclogues*. The name is sometimes used as the type of a bucolic sweetheart, as in the pastoral of *The Faithful Shepherdess*, by Fletcher, and Milton's *Lycidas*.

AM'ASA. See JOAB.

AMASIA, á-mă'sê-á (ancient Gk. 'Αμάσεια, *Amaseia*). A town of Asiatic Turkey, the capital of the sanjak of the same name, in the vilayet of Sivas, on the right bank of the Yeshil-Irmak, 200 miles southwest of Trebizond (Map: Turkey in Asia, G 2). It stands in a deep and narrow valley, and the river flows through a narrow channel, between precipitous rocky banks. The environs are very fruitful and of much natural beauty. Amasia is the centre of the silk industry in Asia Minor, and exports silk to Aleppo, Damascus, and even Constantinople. It contains a fine bazaar and a large number of

AMARYLLIDACEÆ



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1 LILY OF THE PALACE - HIPPEASTRUM
2 NARCISSUS - NARCISSUS PSEUDO-NARCISSUS
3 FOTHERGILLIA - NERINE CURVIFOLIA
4 ATAMASCO LILY - ZEPHYRANTHES ATAMASCO
5 HYMENOCALLIS - HYMENOCALLIS CRASSIFOLIA
6 STAR GRASS - HYPOXIS
7 COOPERIA - COOPERIA DRUMMONDII

Mohammedan schools for higher education. There are to be found the ruins of an old castle, built on the site of the ancient acropolis, and a number of archaic remains. The population is estimated at 30,000. Amasia was the birthplace of the geographer Strabo, and was once the capital of the kings of Pontus.

AMA′SIS (Gk. 'Αμάσις, Egyptian *'Ah-mose*, probably "child of the moon"), or AAHMES. The name of two Egyptian kings.

AMASIS I. The first Pharaoh of the eighteenth dynasty. He reigned for at least twenty-two years, from about 1600 B.C., or perhaps a little later. He finished the long war against the Hyksos or Shepherd Kings, rulers of a foreign race, who had subjugated part of Lower Egypt. He captured their stronghold, Avaris, in the Delta, expelled them from Egypt, and began the Egyptian conquests in Asia by making Palestine and Phœnicia tributary.

AMASIS II. The fifth Pharaoh of the twenty-sixth dynasty, well-known through the anecdotes of Herodotus. Egyptian sources tend to confirm the statements of the Greeks that he was of humble origin, and not particularly refined as to habits. He came to the throne through an insurrection of the native troops against King Apries, whom he dethroned and slew. The usurper reigned from about 570 to 526 B.C., and was a wise and prudent ruler. He fought against Nebuchadnezzar, and later cleverly avoided the conflict with the rising Persian power. (See History of Egypt, under title EGYPT.) The conquest of Cyprus is ascribed to him, though perhaps erroneously. He employed Greek mercenary troops, and assigned to the Greeks the city of Naucratis, in the Delta, which soon rose to great commercial importance. Greek writers speak of Amasis in a very kindly spirit, and endeavor to prove that he was the friend of various Greek sages and statesmen. (See POLYCRATES.) He is said to have married a Greek woman of Cyrene; but it is quite impossible that she could have been his legitimate wife.

AMATEUR′ (Fr., from Lat. *amator*, lover, from *amare*, to love). It would seem at first easy to define the word "amateur" in sports; yet it is a subject that has for half a century taxed the most active and subtle brains of two continents. One would say offhand that the amateur in sport is one who engages in a personal physical contest of pluck, nerve, muscle, and skill for the love of it, as distinguished from the professional, who enters for profit; but that by no means disposes of this intricate subject. There were early found to be men in plenty who entered a particular contest because they loved the sport, and who derived no pecuniary interest from that contest, yet who it was unfair to allow to enter it. As a matter of fact, not long after the renaissance of athletic contests in 1850, it became obvious that the lines would have to be drawn more strictly, or those would have an unfair advantage whose daily occupations gave them a continuous training in the skill needful for perfection. Take, for example, a boat-builder of the old school, one who had been apprenticed to it in his youth, and had spent all his early manhood in the handling of boats and oars, and in rowing and gradually acquiring the knowledge, power, and endurance of a waterman. To such a man, trained and hardened by years, rowing became a second nature, and his skill in it automatic. It was plainly unfair to allow such a man, however much he rowed for love of the sport and without taking money for his prize, to enter contests where the rest of the participants had acquired their knowledge and skill only for the pleasure of the game, and as part of the ordinary routine of school and college, or for health and pleasure's sake. So it came to pass that the boat-builder and waterman were early excluded from the amateur ranks. The same principle has been working itself out ever since. Step by step the fences against professionalism have had to be raised, until now the rules bar them out of all contests under the control of the Amateur Rowing Association of England. No person can enter as an amateur "who has rowed or steered in any race for a stake, money, or entrance fee; who has ever knowingly rowed or steered with or against a professional for any prize; who has ever taught, pursued, or assisted in the practice of athletic exercises for any kind of profit; who has ever been employed in or about boats, or in any manual labor for money or wages; who is or has been by trade or employment for wages a mechanic, artisan, laborer, or engaged in any menial duty; or who is disqualified as an amateur in any other branch of sport." The most jealous stickler for the purity of amateur oarsmanship could hardly desire the line to be more firmly or decisively drawn; yet the rules governing amateur athletics in America do go farther, for *inter alia*, they make a man a professional who engages in an athletic contest where professionals participate, even though no prize is at stake. The following are the rules of the Amateur Athletic Union, which claims jurisdiction over the following games: 1, Basket ball; 2, billiards; 3, boxing; 4, fencing; 5, gymnastics; 6, hand ball; 7, hurdle racing; 8, jumping; 9, lacrosse; 10, pole vaulting; 11, putting the shot and throwing the discus, hammer, and weights; 12, running; 13, swimming; 14, tugs of war; 15, walking; 16, wrestling.

Conditions of Competition. "1. No person shall be eligible to compete in any athletic meeting, game or entertainment given or sanctioned by this Union who has (a) received or competed for compensation or reward, in any form, for the display, exercise, or example of his skill in or knowledge of any athletic exercise, or for rendering personal service of any kind to any athletic organization, or for becoming or continuing a member of any athletic organization; or (b) has entered any competition under a name other than his own, or from a club of which he was not at that time a member in good standing; or (c) has knowingly entered any competition open to any professional or professionals, or has knowingly competed with any professional for any prize or token; or (d) has issued or allowed to be issued in his behalf any challenge to compete against any professional, or for money, or (e) has pawned, bartered, or sold any prize won in athletic competition, or (f) is not a registered athlete. Nor shall any person residing within the territory of any active member of this Union be eligible to compete for or to enter any competition as a member of any club in the territory of any other active member of this Union, unless he shall have been elected to membership in such club prior to April 1, 1891; provided, however, that this restriction as to residence shall not apply to undergraduates connected with any allied college athletic organization.

"2. No one shall be eligible to compete in any athletic meeting, games, or entertainment given or sanctioned by this Union, unless he shall be a duly registered athlete, a member of the organization from which he enters, and shall not have competed from any club in this Union during a period of three months next preceding such entry; nor shall any member of any club in this Union, or any club in any district in this Union, be allowed to compete in case he has within one year competed as a member of any other club then in this Union, except with the consent of such other club, which consent shall be filed with the Registration Committee of his district prior to such competition, unless such other club shall have disbanded or practically ceased to exist; provided, that the requirements of this section shall not apply to any athletic meeting, games, or entertainment, the entries for which are confined to the club or organization giving such meeting or entertainment.

"No athlete who has been released from a club which is a member of this Union, and who competes for another club directly thereafter, shall be allowed to compete again for the club he was released from for one year from the date of his release, except that the club has disbanded or ceased to exist.

"No person shall be eligible to compete for or enter any competition as a member of any club in the territory of any active member of this Union, unless he shall have resided within the territory of said active member at least four months previous to entering for competition; nor shall any person be eligible to enter or compete in any district championship meeting unless he shall have been a *bona fide* resident of such district for at least six months prior to the holding of such championship meeting; and no person shall be eligible to compete in a championship meeting of more than one district in one year. The restrictions contained in this section shall not affect the eligibility of an undergraduate connected with any allied college athletic organization who shall have been elected to membership in any club of this Union prior to November 20, 1899, to represent such club as long as he remains an undergraduate; nor shall these restrictions apply to an undergraduate competing for any college belonging to an allied body.

"3. No prizes shall be given by any individual, club, committee, or association, or competed for or accepted by any athlete, except suitably inscribed wreaths, diplomas, banners, badges, medals, time-pieces and mantel ornaments, or articles of jewelry, silverware, table or toilet service, unless authorized by the Registration Committee."

It will be noticed that this organization does not control golf, in which game amateurs may play in contests against professionals even for a prize; with this limitation, however, that if, in the open contest, an amateur win he must take the prize in plate, and not in money. The golf rules are formulated and enforced by the United States Golf Association.

In cricket there is no bar whatever to playing against or with professionals openly paid for their services or even hired season after season by their clubs; but cricket has been in existence so long, and its ethics are so well understood, that no harm results; the professional needs no laws to define his social position or the part he takes in a game which has escaped the eagerness so characteristic of the more modern games. In fact, in nearly every sport there are shades and differences in definition and practice. Notably is this so in bicycling, wherein the classification has been altered several times, and in football, where the rules of college games extend so far as to limit the contestants to those who have been resident pupils for such and such a time and are in such and such an educational grade. Other minute distinctions entitle a man to or debar him from the right to play, and readers desiring to be perfectly sure of their position on any given sport, in any given year, will do well to consult the actual rules in force formulated by the governing body of the sport.

Professionalism sometimes tends to elevate the standard of sports so far as records are concerned, and it is not in itself necessarily bad. But, although some of the truest sportsmen have been professionals, the nature of sport is such that its best uses, recreation and emulation, are in danger of being lost sight of by the professional whose aim is to make money. Baseball in this country has lost none of its popularity through professionalism, its control now being adequate. Bicycle racing, however, has degenerated into a mere gate-money exhibition. In England football is in danger from the same cause, while in America football is played almost exclusively by the colleges, and professionalism is practically unknown. Into some other sports the spirit of professionalism has never entered; notably is this so in lawn tennis, curling, quoits, canoeing, archery, polo, croquet, and its successor roque. These and a few other games have always been played solely by enthusiastic lovers of them. The amateur spirit is essentially a moral quality, and the games will retrograde, or otherwise, just in proportion as the moral code of the contestants is interpreted. Laws are next to useless where men are determined to evade them. Happily, the tendency of the times is distinctly toward a higher plane of interpretation, and a stricter separation of the amateur from the professional.

AMATI, â-mä'tê. A family of celebrated Italian violin makers, who lived in Cremona. Andrea, the eldest, born about 1520, was descended from an ancient family dating back to the eleventh century. He was the founder of the Cremona school of violin makers. His early instruments are so Brescian in character that he is supposed to have been a pupil of Gasparo da Salò. Few of his violins are extant. His model was small, with high back and belly, amber varnish, and clear though weak tone. Nicolo, his younger brother, made basses in preference to violins, and was his inferior. Andrea's sons, Antonio and Geronimo, worked together much after their father's style. Geronimo also made instruments alone, of larger pattern, and changed the shape of the pointed sound-hole. Geronimo's son, Nicolo (1596-1684), was the most eminent of the family. His model is of extreme elegance. The corners are sharply pointed, the backs and bellies of beautiful grained wood, the sound-holes graceful and bold, the scroll of exquisite cut, and the varnish transparent and of a deep, rich hue. As a rule, he worked after a small pattern, but he produced some large violins, which are now called "grand Amatis," and are highly valued. He also made a number of beautiful tenors and violoncellos. His label reads: *Nicolaus Amati Cremonens. Hieronimi filius Antonii nepos fecit anno 16—.* Antonio Stradivari and Guarneri were his pupils, and the Jacobs of Amsterdam and Grançino of Milan were among his most successful imitators. With Geronimo, his son, the family of Amati ends. He followed their trade, but made indifferent instruments. For a further discussion of the family and their musical inventions see under VIOLIN.

AM'ATITLÁN'. A department, town, and lake of Guatemala, Central America. The town, the capital of the department, situated on the shores of the lake 12 miles southwest of Guatemala city, is also known as St. Juan de Amatitlán. It was founded by Jesuits, who formerly engaged here in extensive sugar-cane cultivation. The gathering of cochineal now constitutes the chief industry, and there is a trade in salt, raw silk, and fruit. Salt and alum wells and hot springs exist in the neighborhood. The lake has a length of nine miles and an extreme breadth of three. The population of the town in 1903 was 12,000; of the department, 35,387.

AM'ATON'GALAND. See TONGALAND.

AM'AURO'SIS (Gk. *ἀμαύρωσις*, a darkening, from *ἀμαυρός*, *amauros*, hardly seen, dim, obscure). A term applied to absolute blindness, with no discoverable changes in the eye. It is also used to include all other cases of total blindness. See AMBLYOPIA.

AMAURY, ȧ'mō'rē'. The title of two kings of Jerusalem. Amaury I. was born in 1135, and reigned from 1162 to 1173. He was the brother of Baldwin III. In 1168 he invaded Egypt, but was driven out by Saladin, who carried the war into Amaury's country in 1170. Amaury II., born 1144, was King of Cyprus (1194-1205), and titular King of Jerusalem in 1198, but never made good his claim to the latter kingdom. He died at Acre in 1205.

AMAURY OF CHARTRES. See AMALRIC OF BÈNE.

AMAXICHI, ä'mȧks-ē'kē, or LEVKAS. The capital of the Ionian island of Santa Maura, or Leucadia (Map: Greece, B 3). It is the residence of a Greek metropolitan, and is built on the edge of the shallow lagoons that separate the northeast part of the island from the mainland, which narrows down less than a mile north to 3500 feet. It has two harbors. Amaxichi derives its name from Gk. *ἄμαξαι*, *amaxai*, cars, which the Venetian garrison employed in bringing down the oil and wine from the inland districts to the point nearest the fort of Santa Maura, where, subsequently, houses began to be erected. Pop., 1896, 5868.

AM'AZI'AH (Heb., "whom Yahweh strengthens"). Eighth king of Judah. He succeeded Joash (or Jehoash), and his reign has by some been fixed approximately at 797-779 B.C. Amaziah undertook two wars, against Edom and against Israel, respectively. In the first he was successful, despite the fact that he had dismissed his mercenaries and thus weakened his army (II. Chronicles xxv : 10). Edom was defeated in the Valley of Salt, and Selah (the modern Petra) was captured (II. Kings xiv : 7). Elated by his success, he challenged Joash, King of Israel, who accepted the challenge only when compelled to. Amaziah was defeated (II. Kings xiv : 12) and taken prisoner to his own capital. Amaziah survived his defeat by fifteen years (II. Kings xiv : 7), when he was killed by conspirators at Lachish (II. Kings xiv : 19). The biblical narrator has a word of praise for Amaziah, because in punishing the murderers of his father, Joash, he did not harm the children of the conspirators (II. Kings xiv : 6).

AM'AZON. A river of South America, formerly called the Orellana, after a Spanish soldier of that name, who first explored it (Map: South America, D 3). The name Amazon is said to be derived from an Indian word meaning "boat-destroyer," from the dangerous action of the tidal waves at the river's mouth. The native name of the river from the mouth of the Negro to the junction of the Marañon and the Ucayali, is Solimões.

The head waters of the Amazon, the Marañon and the Ucayali rivers, rise in the central and northern Peruvian Andes, and after a northerly course parallel with these mountains unite in about long. 74° W., and the united waters pursue an almost easterly course between lat. 5° S. and the equator to the Atlantic, which is reached in long. 50° W., where this meridian intersects the equator. The Marañon, which rises in long. 76° 30′ W. and lat. 10° 30′ S., is properly the head stream of the Amazon, as it is furthest west; but the Ucayali is slightly the larger, and has its source farther south in the Andes in long. 72° W. and lat. 16° S. From long. 70° W., where the Amazon leaves Peru, its course is confined to Brazil.

The total length of the Amazon from the head waters of the Ucayali is about 3300 miles. It is between one and two miles wide where it enters Brazil, and gradually increases in breadth, enlarging to a width of fifty miles at its main mouth; and where it enters the sea the distance across it, from headland to headland, is fully one hundred and fifty miles.

The total area drained by the Amazon is about two and one-half millions of square miles, a territory equal in extent to about 85 per cent. of that of the United States (exclusive of Alaska), and embraces most of the South American continent west of long. 50° W. and between lat. 3° N. and lat. 17° S., except a comparatively narrow strip along the Pacific coast, and a somewhat broader one on the Atlantic. The latitudinal zone drained by the rivers from the north averages only 6° or 7° in width, while that on the south has a breadth of 13° or 14°.

The chief rivers flowing into the Amazon from the north are the Napo, Putumayo, Yapura, and Rio Negro. These rivers flow in a direction more or less parallel with that of the Amazon, and thus they drain but a narrow longitudinal belt.

The chief affluents from the south (in addition to the Huallaga, an affluent of the Marañon, and the Ucayali) are the Javari, Juruá, Purus, Madeira, Tapajos, and Xingu. The Tocantins River practically belongs to this system of southern branches, being connected with the Amazon by an arm of that river, which cuts off the large island of Marajó.

The basin of the Amazon lies almost wholly within the belt of remarkably uniform equatorial heat, so that there is an uninterrupted plant growth throughout the year. There is a moderately heavy rainfall over the whole of the basin, except in the western part, where, east of the Andes, the rainfall is excessive; and higher up among the Andes, where it is deficient. The very heavy rains in the upper waters of the basin are responsible for the enormous amount of water supplied to the river, which makes it (and its western tributaries) navigable to such a great distance from its mouth. In most sections there is a rainy season from January to May, and a six months' dry season from June to December. In the Upper Amazon Valley the rainy season begins in November and continues until July, during which time the prevailing wind is northwest; but in the dry season the wind is chiefly from the southeast. The rainfall amounts to over 100 inches a year in this section.

The alternation of the rainy and dry seasons produces corresponding periods of high and low water in the rivers. Even in the Marañon a rise of 30 feet occurs in the wet season, and throughout the whole length of the Amazon during about half the year its waters are swollen and the adjoining low country inundated. These floods are not by any means of uniform magnitude, and at intervals of every few years abnormally high water occurs. The current of the Amazon averages about 2¼ miles per hour, but its velocity is much increased during the floods.

The drainage basin of the Amazon is remarkably level, and the slope from the outlying bounding highlands is very gradual. The height of land almost to the very sources of the branch rivers does not exceed 1000 feet, and as falls or rapids east of the Andes are almost unknown, these rivers are navigable for the greater part of their lengths. The Amazon and its tributaries form the most remarkable and extensive system of inland water highways in the world. The possibilities of future development in the chain of South American inland navigation are shown by the fact that on the north, the Amazon has water communication with the Orinoco through the Rio Negro and the Casiquiare, while on the south the navigable waters of the Tapajos lack little of connecting it with the head waters of a tributary of the Plata River.

Within the basin of the Amazon there occur horizontal layers of argillaceous rocks and sandstone, which vary in height from 100 feet to ten times that amount. These and other deposits seem to indicate that at one time a local mediterranean sea covered the present Amazonian lowlands, and the Marañon had for its outlet into the western end of this sea a delta, which has gradually moved eastward as the shallow sea became filled up.

Not only the source streams, but nearly all the tributaries of the Amazon, experience a succession of falls where their waters enter upon the floor of the main stream, and some branches have falls higher up. Above these falls, which vary from a succession of rapids to falls of 50 feet, or more, navigation is again resumed. On the Lower Amazon these rapids occur at a distance of only from 200 to 300 miles from the main stream; but the distance increases toward the west, so that on the Madeira and Rio Negro rivers the falls are far removed from the mouths, while most of the southern branch rivers west of the Madeira lie almost entirely within the unobstructed low belt.

Where the Amazon enters Brazil its elevation is less than 300 feet above sea-level. Even at its low stage its usual depth in its lower course is about 150 feet, and in places it is said to be much deeper still. It has been estimated that the Amazon discharges between four and five million cubic feet of water per second; and with this enormous outflowing water there is carried every twenty-four hours a quantity of sediment sufficient to form a solid cube measuring 500 feet on each edge.

The Amazon is navigable by steamers for a distance of about 2200 miles, and for smaller boats to points considerably beyond; but at the entrance to the gorges of the eastern Andes, navigation is practically suspended, on account of the rapids occurring there. Steamboat navigation of the Amazon began in 1853, but it was not until 1867 that the navigation of the river was thrown open to the world. Now regular lines of steamers ply from the mouth of the Amazon to Yurimaguas on the Huallaga River in north central Peru. Vessels enter the Amazon through the estuary of the Para River, since the main mouth of the Amazon north of Marajo Island is shoal water filled with rocky islands.

At the mouth of the Amazon there is a continual battling of the river current, the tides, and the winds. The tidal influence is felt up the river to a distance of about 400 miles. The tidal bore is at times so pronounced as to form successive walls of water ten to fifteen feet in height, which noisily sweep everything before them in their mad rush against the river current. The latter is perceptible at a distance of fully 200 miles seaward from the mouth of the river.

The importance of the Amazon as a highway of foreign commerce will become greater and greater as the economic development of Brazil proceeds, when in exchange for the ever-increasing quantities of tropical products exported from the Amazon basin, there will be returned the manufactures and products of the temperate zones.

FAUNA. The Amazon Valley is covered with thick forests of lofty growth, which are thinly inhabited by numerous independent savage tribes. The animal life is exceedingly rich in numbers, but the flood conditions which so generally compel arboreal habits in unaquatic animals greatly limit at least the species of mammals. The principal animals are the tapir, jaguar, panther, cavy, armadillo, sloth, peccary, ant-eater, and monkey. Birds are exceedingly numerous; many of them are songless, but bedecked with gorgeously colored feathers; such are the humming birds and parrots. Among the snakes, the giant anaconda is the best known, and of the lizards the iguana attains formidable size. Numerous alligators and turtles, and the great water mammal, the manatee, frequent the river and its branches. Of fishes there is a greater variety than in any other stream, and in fact a large proportion of the present known species are found in the Amazon. Insects exist in the forests in countless numbers. Neither the fauna nor the flora of the Amazon has been more than partly studied, and that mostly by visiting naturalists.

FLORA. The flora of the immediate vicinity of the river is that which flourishes in a watery soil, and which will survive the long-continued annual inundation which occurs in midsummer. There is no suspension of plant activity, and the leaves remain green throughout the year, and no month is without its bloom or fruit. Aquatic plants grow in great profusion and attain enormous size, a prominent example being the giant lily, *Victoria regia*. In the undergrowth occur rubias, myrtles, leguminosæ, epiphytic orchids, bromelia, and ferns.

The Amazonian forest presents to the river a wall-like frontage of trees, interwoven with vines and roots clothed and fringed with moss in the most fantastic manner. A continuous mass of verdure overhead has a secondary flora of its own. Some of the trees grow to a height of even 200 feet. The largest unexplored areas of South America are in the Amazon basin, and especially between the Tocantins and the Madeira rivers. The quest for rubber is rapidly revealing the untraversed tracts between the large tributaries. See BRAZIL.

Among the ports on the Amazon (from its mouth upward) are Macapá, Santarem, Obidos, Manáos, Teffe, and Tabatinga. The commercial outlet of the Amazon basin is Pará.

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AMAZONAS, ä′mȧ-thō′nȧs. A northern department of Peru, bounded by Ecuador on the north, the Peruvian department of Loreto on the east, Libertad on the south, and Cajamarca on the west. Area, 13,943 square miles. It is slightly mountainous and has a fertile soil. The population was officially estimated in 1896 at 70,676. Capital, Chachapoyas.

AMAZONAS, or **ALTO AMAZONAS**. The northernmost and largest of the Brazilian States, bounded by British Guiana, Venezuela, and Colombia on the north, State of Pará on the east, Bolivia and the State of Matto Grosso on the south, and Colombia and Peru on the west (Map: Brazil, E 4). Its total area is 732,439 square miles. The surface, with the exception of a few mountain chains on the Venezuelan border, is one alluvial plain, covered with impenetrable forests, and intersected by the River Amazon, with its numerous tributaries, including the Rio Negro and Madeira. The climate, although hot, is not unhealthful, and the soil is very fertile. Industrially, the State is very little developed, and its principal articles of trade are food products. With an area three and a half times as large as that of France, an abundance of fertile land, and excellent waterways, Amazonas had (1900) a population of 249,756, or about one inhabitant for three square miles. Capital, Manáos, which is also the chief port. Amazonas formed a part of the State of Pará, and was constituted a separate State in 1850. Consult: J. Verissimo, *Pará e Amazonas* (Rio de Janeiro, 1899); C. L. Temple, *The State of Amazonas* (London, 1900).

AM′AZONITE, or AMAZON STONE. See MICROCLINE.

AM′AZONS, AMAZ′ONES (from Gk. Ἀμαζών, *Amazōn*). In early Greek legends, a race of warlike women, who either suffered no man to live among them, or held men in servitude for the continuance of the race. The earliest accounts place them in northeast Asia Minor, on the River Thermodon; later writers, farther to the north and west, in Scythia and the Caucasus; and finally we hear of Amazons in Libya, at the south of the known world. Their expeditions, undertaken for war and plunder, led them into Scythia and Syria, but especially to the coast of Asia Minor, where we find them in conflict with Priam, Bellerophon, and other heroes. In this region they were said to have founded many cities, notably Ephesus, where they established the temple of Artemis, which furnished them a refuge when defeated by Hercules. They were daughters of Ares, and worshiped him and Artemis as their chief gods. They appear chiefly in three stories: (1) The killing by Achilles of their queen Penthesilea, who led her army to the relief of Troy; (2) the conflict with Hercules, which arose from his endeavor to secure the girdle of their queen, and led, according to some writers, to their annihilation; (3) the war with Athens, which began with the expedition of Theseus to carry off the Amazon queen, and ended with their invasion of Attica, attack on the Acropolis from the Areopagus, and total destruction by Theseus and the Athenians. The origin of these legends is not clear; but if we consider the localities in which the Amazons lived, and that in historic times the Greeks found tribes about the Black Sea in which the women held sway and took part in war, while in Caria, Lycia, and Lydia there is much evidence for descent traced through the mother, it seems not improbable that the Amazons embody a reminiscence of the people and civilization which preceded the Greeks on the east of the Ægean. Representations of the Amazons are very common in all periods of Greek art. At first they appear in the costume of Greek hoplites, but later assume the Scythian garb. They are armed with lance, battle axe, or bow, and usually carry a crescent shield. Among the chief ancient representations are the reliefs from Gyölbaschi, in Vienna, which seem to reflect the painting of Micon at Athens; and the friezes from Phigalia and the mausoleum at Halicarnassus, in the British Museum. Of the statues, three types go back to the best period of Greek art; the "Wounded Amazon," in Berlin, probably by Polycletus; the "Wounded Amazon" of the Capitoline Museum in Rome, and the "Unwounded Amazon" in the Vatican. It was said that in order to be unimpeded in war, they burned off their right breasts; but no work of art shows them thus mutilated, and undoubtedly the story is merely an invention to explain a false etymology, as though the composition of the word Amazon were ἀ priv. and μαζός, *mazos*, breast. Consult: Klügmann, *Die Amazonen in der attischen Litteratur und Kunst* (Stuttgart, 1875), and Corey, *De Amazonum Antiquissimis Figuris* (Berlin, 1891).

AM′BAKIS′TA. A Bantu tribe of Amboia, Portuguese West Africa. They were enterprising traders originally, but were ruined by the Portuguese, and dispersed to other regions.

AMBALA, ȧm-bä'lȧ, or **UMBALLA**. A city in India, capital of the district of Ambala in the Punjab (Map: India, C 2), and an important station on the Sindh, Punjab, and Delhi Railway, 150 miles northwest of Delhi. It is a large, walled town, in a level, well-watered, and cultivated country, and has an extensive trade. It contains a fine Gothic church, a Presbyterian church, dispensary, hospital, and leper asylum. The town was founded in the fourteenth century. Here, at a grand durbar, in 1869, Shere Ali, Ameer of Afghanistan, concluded a treaty with Lord Mayo, Governor-General of India. Population, 1901, 79,300, including the English military station or cantonment near by.

AMBALEMA, äm'bȧ-lā'mȧ. A city in the department of Tolima, Colombia, on the left bank of the Magdalena (Map: Colombia, B 2). The city lies 28 miles above Honda in the midst of an excellent tobacco-growing district, and is one of the most modern as well as one of the most thriving towns of Colombia. Pop., 8000.

AM'BARI HEMP. See Hibiscus.

AMBAS'SADOR (Med. Lat. *ambasciator*, agent, from *ambasciare*, to go on a mission, earlier *ambactiare*, from Lat. *ambactus*, vassal; according to Festus, of Celtic origin; compare Welsh *amaeth*, husbandman, and Goth. *andbahts*, servant; Ger. *Amt*, office). The highest rank of public minister accredited to a foreign court. Though used popularly and sometimes by writers on public law in a loose sense as the equivalent of minister (q.v), the term is strictly appropriately used only of the highest of the four orders of diplomatic agents established by the Congress of Vienna in 1815, and that of Aix-la-Chapelle in 1818. The classification then adopted, which has been generally accepted, is as follows: (1) Ambassadors, and legates and nuncios of the Pope. (2) Envoys and ministers plenipotentiary. (3) Ministers resident, accredited to the sovereign. (4) Chargés d'affaires.

The ambassador is supposed to represent directly the person of his sovereign, who signs his credentials, or letters of credence, and the ambassador, therefore, enjoys of right the privilege of personal communication with the sovereign to whom he is accredited. Ministers and chargés d'affaires do not, in theory, possess this right, though in the case of the minister, at least, the privilege is not usually denied. The chargé d'affaires is, in fact, not accredited to the sovereign, but to the minister of foreign affairs, and is regarded merely as an agent of his government to transact the business intrusted to him. Modern methods of carrying on the diplomatic intercourse of states have greatly diminished the relative importance of ambassadors, as compared with other diplomatic agents, and little remains of their primacy excepting a superior dignity and impressiveness and certain rights of precedence on ceremonial occasions. Prior to 1893 the Government of the United States had been represented abroad by no agents of higher rank than ministers resident, who were, in the case of the great Powers, accredited as envoys extraordinary and ministers plenipotentiary. But in that year Congress passed an act authorizing the President to accredit ambassadors to certain European courts. Later the work of ambassador was conferred on the ministers to Mexico, Brazil, and Japan. The countries in which the United States was represented by ambassadors in 1906 were Austria-Hungary, Brazil, France, Germany, Great Britain, Italy, Japan, Mexico, and Russia. The privileges and immunities of ambassadors are dealt with under Diplomatic Agents. See also Asylum, Right of; Exterritoriality; Legation.

AMBATO, ȧm-bä'tȯ, or Asiento de Ambato, ȧ-syān'tȯ dā ȧm-bä'tȯ. A town in the province of Leon, Ecuador, on the northeastern slope of Chimborazo, 78 miles south of Quito, and 8859 feet above the sea (Map: Ecuador, B 4). It was destroyed in 1698 by an eruption of Cotopaxi, but was soon rebuilt, and became more flourishing than before. It carries on an active trade in grain, sugar, and cochineal, the products of the surrounding country. Pop., about 10,000.

AM'BER (From Ar. *'anbar*, ambergris; called so from its resemblance to ambergris). A fossil resin of vegetable origin. It is usually of a pale-yellow color, sometimes reddish or brownish; it is sometimes transparent, sometimes almost opaque. It occurs in round irregular lumps, grains, or drops; has a perfectly conchoidal fracture, is slightly brittle, emits an agreeable odor when rubbed, melts at 550° F., and burns with a bright flame and pleasant smell. Thales of Miletus was the first to notice that when amber is rubbed it becomes capable of attracting light bodies; this was the first electric phenomenon produced by man. An acid called succinic acid (named from the Lat. *succinum*, amber) is obtained from it by distillation. Amber had formerly a high reputation as a medicine, but the virtues ascribed to it were almost entirely imaginary. It is employed in the arts for the manufacture of many ornamental articles, and for the preparation of a kind of varnish. Great quantities are consumed in Mohammedan worship at Mecca, and it is in great demand throughout the East. It was obtained by the ancients from the coasts of the Baltic Sea, where it is still found, especially between Königsberg and Memel, in greater abundance than anywhere else in the world. It is there partly cast up by the sea, partly obtained by means of nets, and partly dug out of a bed of carbonized wood. Limited quantities of it are found in the United States. It sometimes occurs in diluvial deposits, as in the gravel near London; but it is very rare in Great Britain. It is obtained in small quantities from the coasts of Sicily and the Adriatic, and is found in different parts of Europe, in Siberia, Greenland, etc. It sometimes incloses insects of species which no longer exist. Leaves have also been found inclosed in it. Specimens which contain insects or leaves being much valued, artificial substitutes are often manufactured and imposed upon collectors. According to an ancient fable, amber is the tears of the sisters of Phaëthon, who, after his death, were changed into poplars. The ancients set an immense value upon it. Pieces of amber have occasionally been found of twelve or thirteen pounds weight, but such pieces are extremely rare.

AMBER-FISH. Any of several carangoid fishes of the genus Seriola, numerous on both coasts of North America, which are of moderate size, graceful form, often brightly colored and excellent to eat. The commonest species of the Atlantic coast is *Seriola lalandi*. On the Pacific coast an allied species (*Seriola dorsalis*), the yellowtail, is highly valued as a food-fish, and by anglers. For further discussion and illustration, see Horse Mackerel.

AMBERG, ăm′bĕrĸ. The old capital of the Upper Palatinate in Bavaria, 35 miles east of Nuremberg and 32 north of Ratisbon (Map: Bavaria, D 4). It is situated on both sides of the Vils, and is well built. The ancient walls are now transformed into shady avenues. Amberg is the seat of the court of appeal for the district, possesses a library of 34,000 volumes, a lyceum, an agricultural and industrial school, a municipal hospital, a house of correction, etc. There is also a royal factory for the manufacture of arms. The principal products are earthenware, woolen cloths, ironmongery, and beer. Near Amberg, Archduke Charles defeated the French under Jourdan on August 24, 1796. Pop., 1890, 19,000; in 1900, 22,096; in 1905, 24,303.

AMBERGER, ăm′bĕrĸ-ẽr, Christoph (c. 1500-c. 1561?). A German painter. He was received into the Augsburg guild in 1530, and is best known for his careful portraits of contemporaries, particularly those of Charles V., Frundsberg, and the geographer Münster. Various altar-pieces by him are in Augsburg churches.

AMBERGRIS, ăm′bẽr-grēs (Fr. *ambre gris*, gray amber; Ar. *'anbar*). Also spelled *ambergrise* and *ambergrease*. A fatty secretion formed in the bowels of some sperm whales (q.v.), and valued as a material for perfume. It is taken from whales directly, but more is found floating in waters (especially of the tropics) frequented by these cetaceans, or cast upon the beaches in lumps of all sizes up to a mass exceeding 200 pounds in weight. It is lighter than water, gray marbled with blackish in color, opaque and waxy in consistency, softens readily under heat, melting into resinous liquid at 145° F., and develops on exposure to the air a sweet, "earthy" odor in place of its disagreeable smell when first taken from a whale. Chemically, it is soluble in oils, but resists acids; and it dissolves readily in hot alcohol, yielding a substance termed ambrein. As this is closely related chemically to known biliary secretions, it is further evidence that ambergris is of this nature, perhaps induced by, and partaking of, the squids upon which the sperm whale largely feeds, remains of whose beaks are frequently found mixed with it. Like other bezoars and substances of mysterious origin, ambergris was formerly regarded as an efficacious medicine, but its virtues were imaginary, and it is no longer used in pharmacy, nor as a flavor in cookery, except among a few barbarians of the East. It has a high commercial value, however, as a material for the manufacture of various perfumes, and the price is increasing, owing to the increasing rarity of the sperm whale, and a growing demand. Hence it is adulterated and imitated; a test of its genuineness is described as "its solubility in hot alcohol, its fragrant odor, and its uniform fatty consistence on being penetrated by a hot wire."

AM′BER ISLANDS, or Electrides. In later Greek geography, the islands, famed for their amber, in the North Sea, from Denmark to the mouth of the Rhine. Also certain islands at the mouth of the legendary river Eridanus (the Po).

AMBERT, äɴ′bâr′, Joachim Marie Jean Jacques (1804-90). A French general and writer. He was born at Chillas, near Cahors (Lot), and was educated at St. Cyr. He served in the Spanish and Belgian campaigns, distinguished himself in Algeria, and became brigadier-general in Europe. He traveled extensively in Europe and America, and for some time was a contributor to *L'Abeille*, a French journal published at New Orleans. Among his numerous writings are: *Etudes tactiques* (1865), *Histoire de la guerre de 1870-71* (1873), *Les soldats français* (1878-82), *Gaulois et germains, récits militaires* (1884-86).

AM′BER WITCH, The. An English opera by W. V. Wallace, the text being by H. F. Chorley, first presented at Her Majesty's Theatre, London, February 28, 1861. Its incidents are based on those of a German story by Meinhold (1843).

AM′BIGU′ITY (Lat. *ambiguus*, going about hither and thither, uncertain, doubtful). In law, the duplicity or uncertainty of meaning of a word, clause, or other part of a written instrument. The rule of evidence forbidding the admission of parol evidence to contradict, vary, or explain a written document is subject to the important exception that parol evidence may be introduced for the purpose of explaining an ambiguity in a written instrument. Ambiguities are "patent" and "latent." A patent ambiguity is one which appears on the face of an instrument without referring to any intrinsic fact or circumstance. Thus, if a testator after referring in his will to two persons named John, made a bequest to John, the term of the bequest would constitute a patent ambiguity. A latent ambiguity is one which is disclosed only by the proof of extrinsic facts. Thus, if a testator made a bequest to a person, naming or otherwise describing him, and it appeared extrinsically that there were two persons answering the description, the terms of the bequest would constitute a latent ambiguity. It is sometimes said that parol evidence cannot be introduced to explain a latent ambiguity. While the judicial decisions are not altogether harmonious, the weight of authority does not favor such a rule. See the authorities named under the titles Contract, Will, and Evidence.

AMBI′ORIX. A chief of the Eburones in Belgic Gaul, who fought against Julius Cæsar in 54 b.c. By cunning and strategy he defeated one important Roman garrison and massacred every man; but while on the march to another camp, he encountered Cæsar himself, who easily defeated him, though Ambiorix with a few men escaped into the forests.

AMBI′TIOUS STEP′MOTHER, The. A tragedy by Nicholas Rowe, produced and printed in 1700. The scene is laid in Persepolis.

AM′BLER, James Markham Marshall (1848-81). An American surgeon, born in Fauquier Co., Va., and educated at the medical college of the University of Maryland. He volunteered as surgeon to the *Jeannette* Arctic expedition in 1879 (see De Long, George W.), and was in the first cutter with De Long when the officers and crew left the sinking vessel (June 13, 1881). His body was found March 23, 1882, and buried on Monument Hill, on the Lena Delta, where a pyramidal structure of stone and timber was erected to the memory of the explorers.

AM′BLESIDE. A town in the heart of the English lake district, Westmoreland; a favorite resort for tourists on account of its scenery and its nearness to points of historic interest, the homes of Wordsworth, Dr. Arnold, and others. Fragments of Roman buildings have been found in the neighborhood. Stock Gill Force is a waterfall in the hills near the town. Pop., 1901, 2536.

AMBLETEUSE, äɴ'bl'-tẽz'. A seacoast village of France, in the department of Pas-de-Calais, on the English Channel, about 15 miles southwest of Calais and six miles north of Boulogne. It is famous as the landing place of James II. after his flight from England in 1689. There is a monument erected by Napoleon to the Grand Army in 1805. Pop., 1901, 685.

AM'BLYO'PIA (Gk. *ἀμβλυώπια*, dim-sightedness, from *ἀμβλύς*, *amblys*, blunt, dull + *ὤψ*, *ōps*, eye). A name given to diminished acuteness of vision not relieved by the use of glasses, and not accompanied by any visible ocular changes. The term is, however, sometimes more loosely used to include other forms of imperfect sight. Congenital amblyopia of one or both eyes is often due to hyperopia, myopia, or astigmatism. These prevent perfect vision, and although the use of proper glasses may eventually cause an improvement in young persons, this is impossible if the lack of proper vision has lasted long. Congenital amblyopia for colors (see Color Blindness) may occur with a contraction of the field. Hysterical amblyopia, usually unilateral, may amount to total blindness. There is contraction concentrically of the field of vision for white and colors, and the fields for colors do not maintain the relative sizes which they normally possess. There are generally other hysterical symptoms. Simulated amblyopia is simply a pretense of blindness in one or both eyes, and is usually readily detected. Toxic amblyopia is produced at times by large doses of quinine, or excessive and continual use of tobacco, alcohol, opium, and other drugs. If the drug is entirely given up recovery usually occurs after a long time. Malarial amblyopia of one or both eyes is usually relieved by quinine. Uræmic amblyopia sometimes appears suddenly in both eyes during an attack of uræmia, without retinal changes, though at times accompanying an albuminuric retinitis. It is generally very transitory. See Sight, Defects of.

AM'BLYOP'SIDÆ (Gk. *ἀμβλύς*, *amblys*, dull + *ὄψις*, *opsis*, the look, eyesight). A family of small fishes allied to the cyprinodonts, mostly living underground, and having their eyes in varying degrees of degeneration. See Cave Animals.

AMBLYS'TOMA (Gk. *ἀμβλύς*, *amblys*, blunt, dull + *στόμα*, *stoma*, mouth). A genus of salamanders ranging over Mexico and the United States. They generally prefer damp climates, for the fifteen or more species are grouped in the watered regions on either side of the arid plains. Only one species (*Amblystoma tigrinum*) ranges over all of the United States and into Mexico. The eastern examples transform early and while yet small. The larval or "axolotl" stage of the western forms grows large, transforms late, and may even become sexually mature while still bearing external gills. One Mexican form has never been observed to metamorphose. See Axolotl, and Salamander.

AM'BO (Lat. *ambo*, Gk. *ἀμβων*, from *ἀναβαίνειν*, to ascend). The pulpit or reading-desk used in the early Christian churches. There were usually two of them, placed on either side of the raised choir for the lower clergy, which occupied the upper part of the middle nave, below the altar. These ambones were entered from within the choir, and stood on its outside edge, toward the aisles, connected with the encircling parapet or screen. They had usually a double staircase on either side, and three levels; the upper for the reading of the Gospels and for preaching, confessions of faith, and important ecclesiastical announcements; the middle one for the reading of the Epistles; the lower for other parts of the Bible. Usually one ambo was devoted to the reading of the Gospels, and near it stood the paschal candlestick, while the second ambo was for the Epistles. The earliest ambones are at Ravenna (cathedral and Sant' Apollinare). Those at Rome are mediæval (San Clemente, San Lorenzo), but are better preserved. They were of marble, merely carved in the earliest examples; inlaid with mosaics in later times. To the form with a single stairway the term "pulpit" is more appropriate. See Pulpit.

AMBOISE, äɴ'bwäz'. A town on the left bank of the Loire, in the department of Indre-et-Loire, France (Map: France, H 4). It is 15 miles by railway east of Tours, and lies in a region so rich in vineyards that it has been called "the garden of France." The town has considerable steel manufactures and a trade in leather and cloth. It possesses a castle, in which several of the French kings have resided. Charles VIII. was born here. It was also the scene of his death. The town owes much of its importance to the renown of the great churchmen and statesmen, Cardinal Georges and François Charles d'Amboise. The town is memorable as the place in which the religious wars which devastated the kingdom during the sixteenth century broke out, and where the word "Huguenot" was first applied to the Protestant Party. The castle of Amboise was much improved by Louis Philippe, and was the residence of the Arab chief Abd-el-Kader during his captivity in France. Pop., 1901, 4538. Consult Chevalier, ***Inventaire analytique des archives communales d'Amboise, 1421-1789*** (Tours, 1874).

AMBOISE, Georges d' (1460-1510). Cardinal and Prime Minister under Louis XII. of France. He was born at Chaumont-sur-Loire. At a very early age he became almoner to Louis XI. It is generally stated that he became Bishop of Montauban at fourteen; but he did not attain to the dignity till the age of twenty-four. In 1493 he was made Archbishop of Rouen, and in 1499 Cardinal. Initiated in early years into the intrigues of the court, he soon, by his zealous services, secured the confidence of Louis of Orleans (Louis XII.), by whom he was made Premier in 1498. From this time Amboise became the prime mover in all the political affairs of France. By his advice the King undertook the conquest of Milan, which had such great influence on the fortunes of France. After the death of Pope Alexander VI., Amboise endeavored to raise himself to the Papal see, and, having failed, became the dangerous enemy of the succeeding popes. Pius III.—who occupied the Papal chair only twenty-seven days—and Julius II. To secure his own election, Amboise encouraged a schism between the French Church and the see of Rome, and convoked a separate council, held first at Pisa, afterward at

Milan and Lyons; but his plans were frustrated by the failure of the French army in Italy. Cardinal Amboise was a dexterous, experienced, and ambitious statesman. He governed France wisely, introduced reforms in the judicial system, reduced taxation, and by his benevolence earned the respect of the whole nation. Consult: Le Gendre, *Vie du Cardinal d'Amboise* (Rouen, 1726); Hardouin, *Le Cardinal d'Amboise* (Rouen, 1875).

AM′BOY CLAYS. A great series of upper Cretaceous clay deposits found extensively developed in northeastern New Jersey, especially in the region around Perth Amboy, whence the name. The beds, which are of non-marine origin, are also known as the Raritan clays, because the Raritan River flows through the area in which they outcrop, and their total thickness, including the interbedded sands, is about 350 feet. A few of the beds contain an abundance of plant remains, as well as some of mollusks. The Amboy clays are of great economic value, being used in the manufacture of chinaware, firebricks, stone ware, brick, and tile. Large pits have been opened in the deposits at Perth Amboy, South Amboy, Woodbridge, and other points. The clays are used chiefly within the State, but large quantities are also sent to neighboring States. See CRETACEOUS SYSTEM; FIRECLAY; CLAY.

AMBOY′NA (Malay *Ambun*), APON, or THAU. The most important of the Moluccas, belonging to the Dutch, and lying southwest from Ceram, and northwest from Banda. The island covers an area of 264 square miles and is divided by the bay of Amboyna into two unequal peninsulas (Map: East India Islands, G 5), Hitu, the larger, and Leitimor, the smaller. The surface is highly mountainous, and traversed by numerous streams abounding in fish. The soil is fertile and produces coffee, pepper, indigo, and rice. But the main product of the island is the clove, which grows there in abundance, and constitutes the chief article of commerce. A great part of the island is covered with forests full of valuable woods. The inhabitants in 1895 numbered 38,663. They are physically and linguistically Malayan, although some Papuan admixture from Ceram has occurred. They have also some Portuguese blood. Their language contains a considerable Portuguese element, and their religion is Protestantism (introduced by the Dutch), with the addition of rites and ceremonies borrowed from the Portuguese Catholics, and inherited from their aboriginal past. The residency of Amboyna comprises besides the Amboyna Island, the Southern Moluccas, the Banda group (q.v), Ceram, Buru, Kei Islands (q.v.), Aru Islands, and a few other islands, with a total area of 19,871 square miles and a population, 1900, of 275,106. The capital of the island and of the residency is Amboyna (q.v.). The history of Amboyna is similar to that of the Moluccas, except for the massacre of the British settlers by the Dutch in 1623, for which the Dutch Government was compelled by Cromwell in 1654 to pay the sum of £300,000, in addition to a small island, as a compensation to the families of the massacred. Consult: *The Barbarous Proceedings Against the English at Amboyna* (London, 1651); Beaumont, *Dutch Alliances* (London, 1712); Verbeek, "Over de geologie van Ambon," in volumes 6 and 7, *Koninklijke akademie van wetenschappen* (Amsterdam, 1899).

AMBOYNA. The capital of the Dutch residency of that name, situated near the middle of the northwest shore of Leitimor, one of the peninsulas of the island of Amboyna, in 3° 41′ S. lat., and 128° E. long. It is well-built, has wide streets, and contains a church, several schools, a hospital, and an orphan asylum. The government buildings are situated in Fort Victoria. The roadstead is spacious and affords safe anchorage. The town suffered considerably during an earthquake in January, 1898. Pop., 1900, 7978.

AMBOYNA WOOD. See KIABOUCCA.

AMBRA′CIA (Gk. Ἀμβρακία, *Ambrakia*). A Greek city in the southern part of Thesprotia, on the Arachthus River, about ten miles from the mouth of the river. It was colonized by the Corinthians, under the leadership of Gorgus, son of Cypselus, in the last half of the seventh century B.C., and soon rose to a position of great wealth and power. Pyrrhus of Epirus made it his capital, and enriched it with many public buildings and works of art. The latter were removed and carried to Rome when the town was taken by the Romans in 189 B.C. After Augustus, in 31 B.C., transferred the inhabitants of Ambracia to the newly founded city of Nicopolis, the former town sank into insignificance. The modern town is Arta.

AMBRA′CIAN GULF. See ARTA, GULF OF.

AM′BREE, MARY. The subject of a ballad included in Percy's *Reliques of Ancient English Poetry;* a woman who to avenge the death of her lover is said to have disguised herself as a soldier and fought against the Spaniards at the siege of Ghent in 1584. Though unknown in history, she is frequently alluded to by the poets, especially by Ben Jonson, who refers to her in his *Epicœne* (iv. 2), *Tale of a Tub* (i. 2), and *Fortunate Isles*, by Fletcher, in his *Scornful Lady* (Act v.), and by others of the period, to whom she became a sort of typical virago.

AMBRIZ, ȧm-brēz′. A seaport town, the capital of a district of the same name, in Portuguese Angola, West Africa. It has a large export trade in coffee, ivory, and gums. Extensive copper deposits exist in the district. Its occupation dates from 1855. Pop., 2500.

AMBROGIO IL CAMALDOLESE, ȧm-brō′jō ēl kȧ-mäl′dō-lā′zȧ (properly AMBROGIO TRAVERSARI) (1378-1439). An Italian humanist and Greek scholar, born in the Romagna. He early entered the Convent degli Angeli at Florence, studied the Greek ecclesiastical writers in the original when a knowledge of Greek was rare even among scholars, and in 1431 was appointed Director General of the Camaldolese Order by Eugenius IV. A member of the circle which Cosimo de' Medici had assembled at Florence for the restoration of the studies of antiquity, he prepared at the request of Cosimo a translation of Diogenes Laërtius. Symonds refers to him as a "little, meagre, lively, and laborious man."

AMBROS, ăm′brōs, AUGUST WILHELM (1816-76). One of the greatest authorities on the history of music. He first attracted attention by his *Die Grenzen der Poesie und Musik* (1856). His fame rests on his *Geschichte der Musik* (begun 1860), the result of original researches, which led him to undertake extensive travels. He died before the completion of the fourth volume, which treats of Palestrina. The work was completed by F. W. Langhans. Ambros's compositions include pianoforte pieces, songs, two masses, and a national opera, *Bretislav a Jitka.*

AM'BROSE, Saint (c. 340-397). One of the most celebrated of the ancient Fathers of the Church, and one of the four doctors of the Western Church. He was born about the year 340, at Trèves, where his father, as prefect of Gaul, was wont to reside. According to his earliest biographer, Ambrose received a fortunate omen even in his cradle: a swarm of bees covered the slumbering boy, and the astonished nurse saw that the bees clustered round his mouth without doing him any harm. His father, perhaps remembering a similar wonder related of Plato, foretold from this a high destiny for Ambrose. He received an excellent education in Rome with his brother Satyrus, who died early, and his sister Marcellina, who became a nun. Ambrose studied law and entered the civil service, and soon distinguished himself so much that he became, about 370, a consular magistrate in upper Italy, with his court at Milan. In this office his gentleness and wisdom won for him the esteem and love of the people, whose prosperity had been much injured by the troubles caused by Arianism. Accordingly, he was unanimously called, by both Arians and Catholics, to be Bishop of Milan in 374. He long refused to accept this dignity, and even left the city; yet he soon returned, was baptized, as hitherto he had been only a catechumen, and was consecrated eight days afterward. The anniversary of this event is still celebrated as a *fête* by the Catholic Church. As a bishop, Ambrose won universal reverence by his mild and gentle, though, toward wickedness of every kind, severe and unbending character. Thus he defended the churches of Milan against the proposed introduction of Arian worship by the Empress Justina (385-86), and brought to repentance and public penance the Emperor Theodosius himself, who had caused the rebellious Thessalonians to be cruelly massacred by Rufinus (390). He is best remembered, however, not as the faithful bishop and wise counselor, nor as the fluent preacher and learned theologian, but as the sympathizing friend of Monica, the mother of Augustine, when she deplored his rejection of orthodox Christian teaching, and as the one whom Augustine heard with pleasure and who received him into the Church. Ambrose died in Milan, April 4, 397. The best edition of his works, in which he followed in many things the Greek theological writers, is that published by the Benedictines (2 volumes, Paris, 1686-90), reprinted in Migne, *Patr. Lat.,* XIV.-XVII., later edited by Ballerini (Milan, 1875-86; 6 volumes); by C. Schenkle in *Corpus Scriptorum Ecclesiasticorum Latinorum* (Vienna, 1896 sqq.). English translation of some of his principal works by H. de Romestin (New York, 1896). For his biography consult Barry (London, 1896). His fifteenth centenary was observed in Milan in 1897. Consult *Il Quindici Centenario della morte di S. Ambrogio* (Milan, 1897). The hymn *Te Deum Laudamus* is ascribed to Ambrose, but it is proved to have been written one hundred years later. The Ambrosian ritual has also received his name only because Ambrose had made some changes in it, which are retained at the present day in the Milanese Church. A commentary on the Epistles of Paul, which was formerly ascribed to Ambrose, is now frequently ascribed to the Roman deacon Hilarius, and is usually quoted as the "Commentary of the Ambrosiaster." Ambrose is the patron saint of Milan, and the large Ambrosian Library, established by Cardinal Federigo Borromeo in 1602-09, which now contains the famous cartoon by Raphael for his school of Athens, received its name in honor of him.

AM'BROSE'S TAV'ERN. An old tavern in Edinburgh, noted as the scene of the *Noctes Ambrosianæ* (q.v.) by Christopher North (John Wilson). It is no longer standing; its site is occupied by the new register house.

AMBRO'SIA (Gk. *ἀμβροσία*; *ἄμβροτος, ambrotos,* immortal, from *ἀ, a,* priv. + *βροτός, brotos,* for **μροτός, *mrotos,* mortal). In the classical mythology, with *nectar* (q.v.), the food and drink of the gods. The word is etymologically identical with the Sanskrit *a-mṛta,* immortal, drink of immortality, and the same root appears in the Latin, *im-mortalis.* Naturally the gods not only eat ambrosia, but also bathe and anoint themselves with it; and the adjective *ambrosial* may be applied to any of their possessions. Without ambrosia the gods lose their strength, and if given to mortals it confers ageless immortality. It also preserves bodies from decay. The conception of the nature of ambrosia varied, according to its use. As a food it was like bread; as nectar, like wine. In some of the later writers, nectar becomes the food and ambrosia the drink of the gods.

AMBRO'SIA BEE'TLES. Beetles of the family Scolytidæ, which differ from the barkborers by pushing their galleries deeply into timberwood and feeding upon a substance called "ambrosia." They include the genera Xyleborus, Platypus, Corthylus, and their allies, and are common and often injurious throughout North America. All are very small, elongate, compact beetles, of the form shown in the illustrations of their work on the Plate illustrating Army-Worm and Ambrosia Beetles, and their cylindrical galleries rarely exceed a tenth of an inch in diameter. These galleries penetrate the solid wood deeply, ramify widely, are uniform and free from dust, and have many short branches, serving as brood-cells; their walls are stained, and the perforations and stain injure the wood for many uses, although not sufficient to harm the life of the tree perceptibly. The most interesting feature of their history is the care given to their young, and the cultivation of fungi—acts unique among beetles, and comparable to those of the social hymenoptera. Habits and methods vary among the different genera, but in general are as follows: Within their galleries is found a substance, taking various forms, most usually that of a cluster of chains of beads, which has been named "ambrosia," and which is shown by the microscope to be a fungus. This fungus is succulent, and forms the food of the insects and their young, and it is planted and cultivated by these beetles, which regard its safety with the apparently anxious solicitude that bees feel toward their stores of honey food. It is started by the mother insect upon a carefully prepared bed of wood dust, some species devoting special chambers to this purpose, others starting a bed anywhere near the larvæ, using the excrement of the larvæ as an aid to its propagation. Sap must be present, however, in order to secure its growth, and in most species the sap must be in a condition of fermentation. Then the fungus must be eaten as it grows—kept grazed down—or it will ripen, emit spores, and choke up the tunnels. All these difficulties are so well met by these minute gardeners that many generations in succession sometimes inhabit and continue to enlarge their system of galleries. These are sometimes bored in vigorous timber, but more often in weak trees, and dead wood is sometimes occupied, certain species exhibiting a special predilection for the staves of wine casks. A full treatment of this group and their customs and effects has been given by H. G. Hubbard, *United States Department of Agriculture,* new series, *Division of Entomology, Bulletin No.* 7 (Washington, 1897).

AMBRO′SIAN CHANT. The choral music of the early Christian Church, introduced from the Eastern Church into the Western by St. Ambrose, Bishop of Milan, in the fourth century. About the real character of this music little is known. It resembled the Gregorian chant, which did not replace it, but was only a general revision of it. It has been stated that St. Ambrose adopted the four authentic modes (see Modes) from the Eastern Church. Although it is probable that he did so, the point has not yet been established by positive evidence. That even after the Gregorian revision the Milan liturgy retained some special characteristics we learn from the statements of some mediæval writers; but what these peculiarities were we do not know. Proof is wanting that the famous "Ambrosian Hymn" *Te Deum laudamus* was composed by St. Ambrose; it seems probable that this melody was also taken over from the Eastern Church. Consult: Camilla Perego, *Regola del canto Ambrosiano* (Milan, 1862); A. W. Ambros, *Geschichte der Musik,* Volume II. (Breslau, 1862-82).

AMBRO′SIAN LI′BRARY. A famous library in Milan, so named in honor of St. Ambrose, the patron saint of the city. It was founded in 1602 by Cardinal Federigo Borromeo, who, in 1609, formally opened it to the public. The library contains upward of 175,000 printed volumes and 8400 manuscripts, some of them of great value. Among the latter the chief treasures are a Greek Pentateuch of the fifth century; several palimpsest texts, including an early Plautus; fragments of Ulfilas's Gothic translation of the Bible; the celebrated Codex Atlanticus, containing original drawings and MSS. by Leonardo da Vinci, and a copy of Vergil, with marginal notes by Petrarch. The library possesses a small but excellent collection of paintings, including Raphael's cartoon for the "School of Athens," and the celebrated portrait of Bianca Sforza by Ambruogio da Predis.

AMBRO′SIO, or The Monk. A romance by M. G. Lewis (hence known as "Monk" Lewis), first published in 1795. The hero is a Capuchin abbot of Madrid, who loses his character and is condemned by the Inquisition, but saves himself for a time by a compact with Lucifer.

AMBROSIUS, ȧm-brō′sē-ụs, Johanna (1854—). A German writer. She was born at Lengwethen, East Prussia, August 3, 1854, the daughter of a mechanic, and in 1874 married Joseph Voigt. With only a village-school education, in a life of poverty and daily work, she wrote verses which, by their intense earnestness and rhythmic beauty, at last attracted admiration. Her *Poems* (*Gedichte*), two volumes (1894-97), have passed through numerous editions and have been in part translated.

AM′BROTYPE (Gk. ἄμβροτος, *ambrotos,* immortal + τύπος, *typos,* impression). An early form of positive photograph on glass, similar to the daguerreotype. It consisted of a thin collodion negative backed with a black surface and viewed by reflected light.

AM′BRY, Aumbry, or Almery (O. F. *almarie,* Fr. *armoire,* from Lat. *armarium,* a closet, chest; for the *b,* see Alhambra). A niche in the wall of a church shut in by a door, or a small cabinet of wood by the altar, holding the vestments and utensils for the mass. In monastic buildings, ambries were presses, or even store-rooms or pantries, used for keeping plate, hanging towels, and the like.

AM′BULANCE (Fr. *hôpital ambulant,* walking hospital, from Lat. *ambulare,* to walk). A two or four-wheeled wagon constructed for conveying sick or wounded persons. Ambulances are constructed to run very easily, and are designed to carry one or two tiers of stretchers. Some forms are fitted with water-tank, medicine chest, operating-table, and other conveniences. City hospital ambulances are light, four-wheeled wagons furnished with one or two beds, surgical appliances, and restoratives. Since 1899 electric automobile ambulances have been used by the larger hospitals in the larger cities of the United States. A surgeon rides in the ambulance, and in crowded streets a gong is kept sounding in order that the ambulance may have the road cleared. Ambulances used in the army are large spring wagons provided with all the necessary appliances for the care and transportation of the sick and wounded. In each division of the army these wagons are organized into a corps, and placed under the command of an ambulance officer. Railway cars and steamers are also fitted up with conveniences for transporting patients to more remote and permanent hospitals. The system perfected in this country during the Civil War has now been adopted by most of the civilized nations. Several of the Continental countries keep permanently in store railway trains completely equipped for hospital service. In France an ambulance is a portable hospital attached to every division of an army in the field, and provided with all the requisites for the medical succor of sick and wounded troops. Such an ambulance is stationed at some spot removed from immediate danger, and soldiers after a battle seek those who have been wounded and convey them to the ambulance. The French also introduced the *cacolets,* which consist of two easy chairs slung in panniers across the back of a mule, which are available along paths where no wheel-carriage could pass. The cacolets have since been adopted by other armies, as well as improved hand-litters, and wheeled litters or barrows.

AMBULANCE CORPS. See Hospital Corps.

AM′BULATORY (from Lat. *ambulare,* to walk). A name given sometimes in architecture to passages or covered walks intended for promenades in monastic, collegiate, or cathedral structures, such as the arcades of a cloister. See Monastery.

AM′BUSCADE′ (from Low Lat. *imboscare,* to ambush, from *in,* in + *boscus,* bush, wood).

A device of military strategy often employed in ancient and mediæval warfare; now, owing to the changed conditions of fighting, rarely possible. Originally it had special reference to bodies of men "concealed in a wood," as its name implies. The only modern instance of the use of this particular device occurred at the battle of Santiago, during the Spanish-American War of 1898, when effective damage was inflicted on the American attacking forces by Spanish sharpshooters hidden in the dense foliage of the trees. Ambuscade must not be confused with AMBUSH, which see.

AM'BUSH (For derivation, see AMBUSCADE). A strategical device, enabling one force successfully concealed to surprise, defeat, or capture another. It is probably the one element of strategy that time has never changed; for notwithstanding the transformation that has taken place in the general science of warfare, the ambush with all its variations of form and method still remains. An ambush may be on any scale, from the surprise and capture of a small reconnoitering patrol, to the defeat of an army. In the latter case, it occasionally is described by a more ambitious title by some European authorities, but such is the exception rather than the rule. Every campaign that history has recorded gives incident after incident of the more or less successful practice of this particular form of strategy; but it has been left to the Anglo-Boer War of 1900-01 for its highest and most successful development. In this campaign the Boers practically owed nearly every success to the use of the ambush in one form or another; a typical example was encountered in General Roberts's campaign. During his march to Bloemfontein, a strong detachment of Boer troops, under General Christian De Wet, cleverly concealed themselves among the rocks and kopjes at a place called Sannahspost. A convoy of 128 wagons, carrying valuable supplies and munitions of war, together with their escort, walked unsuspectingly into the trap, and were captured without the firing of a shot or the showing of a single man other than De Wet himself. A body of 200 volunteer horse, sent from the main column to ascertain the whereabouts of the convoy, were similarly captured, and on attempting to escape were practically annihilated by their unseen enemy. Consult Conan Doyle, *The Great Boer War* (London, 1901).

AMEER'. See EMIR.

AM'ELAN'CHIER. A genus of plants of the natural order Rosaceæ distinguished by having five-celled ovaries, each of which is divided by a false partition into two cells, with one ovule in each cell, the ripe fruit including three to five carpels. It consists of a few species of small trees with deciduous simple leaves, abundant racemes of white flowers, and soft, juicy, and agreeable fruit somewhat larger than a pea. The common Amelanchier (*Amelanchier vulgaris*) is a native of the Alps, Pyrenees, etc. Other species are natives of North America and Asia. Amelanchier botryapium is sometimes called June-berry, from its fruit ripening in June, and Amelanchier Canadensis produces a very pleasant fruit. Among the North American species are Amelanchier Canadensis, known as Shad-bush or Service berry, Amelanchier oligocarpa, Amelanchier alnifolia, and Amelanchier rotundifolia. The Amelanchiers are planted in Great Britain merely as ornamental trees. They are hardy.

AMĖLIA, ȧ-mä'lē-ȧ (ancient *Ameria*). A city of Central Italy, 21 miles southwest of Spoleto. It has been the seat of a bishop since 340 A.D., has a cathedral, was the birthplace of Sextus Roscius Amerinus, and claims to be four hundred years older than Rome. Pop., 1901, 6246.

AME'LIA. A novel by Fielding, published by Millar, who is said to have paid £1000 for the copyright, December 19, 1751. Two editions were called for on the day of publication. Much of the story is autobiographical, some of the adventures of the hero, Booth, recalling incidents in the author's earlier life in the country, while the title-character was largely suggested by the personality of Fielding's first wife. The book was a great favorite with Dr. Johnson. Consult Piozzi, *Anecdotes of the Late Samuel Johnson, LL.D.* (London, 1786).

AMELIA ISLAND. A small island off the east coast of Florida, opposite the mouth of St. Mary's River (Map: Florida, G 1). It was settled by General Oglethorpe in 1736, and in 1739 it was the scene of the first bloodshed in the war between Spain and England, a party of Spaniards killing two unarmed Highlanders. After 1808 the island, then a part of Spanish East Florida, was a notorious resort for pirates, smugglers, and slave-traders. In March, 1812, it was captured by rebels against Spain, and immediately handed over to the United States; early in 1813 the United States troops stationed here were withdrawn, and in 1817 the island was captured by a filibustering expedition, while later in the year a Mexican force took temporary possession of it in the name of Mexico. The United States again occupied it in 1818, and held it in trust for Spain until she acquired the Floridas by the treaty of 1819. Consult McMaster's *History of the People of the United States*, vol. iv. (New York, 1893-1900).

AMÉLIE-LES-BAINS, ȧ'mȧ'lē'lȧ'băN' (Fr. 'watering-place of Amelia,' wife of Louis Philippe), formerly called Arles-les-Bains. A famous watering-place and summer resort in France, situated in the department of Pyrénées-Orientales, at the confluence of the Tech and the Mondony, at an altitude of over 700 feet above the sea. It has sulphurous springs, with a temperature from 63° to 145° F., the waters of which are used both externally and internally. It contains a very large military hospital and numerous remains of Roman thermæ. Pop., 1901, 1340.

AMELOT DE LA HOUSSAYE, ām'lō' de lȧ ōō'sȧ', ABRAHAM NICOLAS (1634-1706). A French historian, who was made a prisoner in the Bastille by order of Louis XIV. He published a *History of the Government of Venice*, translations of Machiavelli's *Prince*, of Tacitus's *Annals*, and of Sarpi's *History of the Council of Trent*, the notes to the last of which, written by himself, gave great offense to the advocates of the unlimited authority of the Pope. Voltaire speaks of his histories as very good, and of his memoirs as very faulty.

AMEN' (Heb. word, "it is trustworthy," transliterated into Gk. ἀμήν, *amēn*, Lat. *amen*, and so in later versions). A word differently used in the Scriptures. (1) To express the idea that the thing just stated is true, or will come to pass; e.g. Numbers v : 22; Deuteronomy xxvii :

15 passim; 1. Corinthians xiv : 16; (2) To confirm one's own utterances, as in prayers and doxologies; e.g. Romans xv : 33; Galatians vi : 18; (3) In descriptions of God as Christ; e.g. Isaiah lxv: 16; (Heb. translated "truth") Revelation iii: 14; (4) To introduce an affirmation. This is only done by Christ; e.g. John xiii : 21. In John the amen is doubled, for solemnity and emphasis, as elsewhere.

AMEN, Harlan Page (1853—). An American educator. He was born at Sinking Spring, O., and graduated at Harvard University in 1879, having won a scholarship in each year of his course. In 1895 he became principal of Phillips Exeter Academy, which under his management became one of the foremost educational institutions in the United States.

AMENDE HONORABLE, ȧ'mäɴd' ô'nô'rȧ'bl (Fr., honorable amends, satisfactory reparation). Formerly an infamous punishment to which criminals were condemned who had offended against public decency or morality. It was first introduced in France in the ninth century, and remained in force there until formally abrogated in 1791. It was restored as a punishment for sacrilege in 1826, but disappeared finally in 1830. It consisted of a confession made by a bareheaded and kneeling criminal in open court, conducted thither with a rope around his neck by the common hangman. In popular language, the phrase now denotes a public recantation and reparation to an injured party for improper language or treatment, or is still further extended to mean an apology of any kind, an "honorable compensation" for insult or injury.

AMEND'MENT. A term used with reference both to legislative action and parliamentary and judicial procedure. Amendment in legislation is the alteration of an existing statute by means of a new legislative enactment, which may expressly refer to and modify the earlier law, or which by reason of its inconsistency with the earlier law may impliedly modify its meaning. In general there is no limitation upon the power of legislative bodies to amend or repeal existing laws, except the provisions of the constitution to which the legislative body is subject. The British Parliament, being itself the constitution-making body, has unrestricted power to amend and repeal existing laws. In the United States, Congress has power to repeal laws of the United States, but it has no power to amend the provisions of the constitution. The method of amending the Constitution of the United States is provided by Article V. of that instrument, but the exercise of this power is limited by the provision "that no State without its consent shall be deprived of its equal suffrage in the Senate." The United States Constitution contains no provision directly limiting the power of the State Legislatures to repeal the statute law of the several States: but Article I., Section 10, providing that "No State shall pass any law impairing the obligation of contract," amounts to a restriction on the power of the State Legislature to repeal statutes which are in effect contracts with the citizen of the State. This construction was first established in the celebrated Dartmouth College case (q.v.). The several State constitutions may also, and frequently do, limit the power of the Legislature to amend or repeal existing laws. See Constitutional Law; Abrogation.

Amendment in parliamentary procedure is used in order to vary or to qualify a motion, bill, or resolution before the House. Amendment is usually offered by means of a motion, and when adopted in accordance with the rules of parliamentary procedure becomes a part of the original motion or bill, which may then be voted upon. In the case of bills before legislative bodies, amendment is not infrequently a method of changing the entire scope and meaning of a bill, or of dismissing it from any further consideration. See Parliamentary Law, and the authorities there referred to.

Amendment in the law of pleading and practice is the correction of an error or defect in a pleading or judicial proceeding in the progress of action or proceeding. The amendment may be "as of course," i.e., without application to the counsel or judge, or "on leave," as the statute or rules of pleading and practice may require. Amendment at common law independently of statute might be made to remedy formal defects, by leave of the court at any time before the signing of the judgment in the action. Leave to amend was a discretionary matter, and when granted, it might be on such terms as the court should direct, usually on payment of the costs of the action up to the time of amendment. By modern statutes amendments are allowed after judgment in furtherance of justice, and are more liberally allowed than formerly, when the defect is one of substance or affects the merits of the case. See Pleading; Practice; Statute of Jeofails, and the authorities there referred to.

A'MENEM'HAT. The name of four Egyptian kings of the twelfth dynasty. Amenemhat I.—He reigned for thirty years, beginning about 2130 B.C. How he came to the throne is not known, but on his accession he found Egypt in a state of great disorder. He thoroughly reorganized the government, restored order, and conducted a wise and vigorous administration. He checked the power of the great nobles, and personally superintended a new survey of the whole land. Amenemhat warred in Nubia and on the Asiatic frontier of Egypt, but his chief attention was devoted to internal affairs. He was a great builder, and his monuments are found from Nubia to the Delta. In later times he was esteemed a sage, and, in a work composed, apparently, under the ninteenth dynasty, he is represented as giving instructions in the art of government, based on his own experience, to his son Usertesen (afterward Usertesen I.). Amenemhat II.—He reigned for 35 years, beginning about 2066 B.C. During the first two years of his reign he was regent with his father, Usertesen I., and, for three years before his death, his son Usertesen II. was associated with him in the government. In the twenty-eighth year of his reign he sent an expedition to Punt on the Somali coast. Amenemhat III.—Son of Usertesen III. He reigned for 44 years, from about 1986 B.C. Monuments of this king are found throughout Egypt, but his greatest work was connected with the Fayum (Coptic, *Phiom*, "the lake"). Amenemhat I. (q.v.), had built a dam, reclaiming a considerable extent of land from the highest part of the bed of Lake Mœris. Amenemhat III. greatly extended this system of damming. By means of a large embankment, about 20 miles long, he reclaimed some 40 square miles of fertile land, and, at the same time, converted the lake into a gigantic reservoir, whose waters, replenished annually by the inundation of the Nile, were used for irrigating the adjacent country. The lake continued to serve this purpose down to the fifth century B.C. Later it was gradually dried up, and, under the Ptolemaic dynasty, a Macedonian colony was established on a portion of its former bed. The pyramid of Amenemhat III., at Hawara, near Illahun, is built of Nile brick and formerly had a casing of limestone. When entered by Petrie, in 1889, the King's stone sarcophagus was found in the sepulchral chamber, but the mummy had been removed. Adjoining the pyramid are the ruins of the famous Labyrinth, formerly a gigantic peristyle temple, covering an area 1000 feet long by 800 feet broad. Amenemhat IV.—Son of Amenemhat III., reigned for some nine years, from about 1941 B.C. His reign seems to have been marked by no event of special importance.

A′MEN-HO′TEP. See Amenophis.

AMEN′ITIES OF LIT′ERATURE. A work relating to English literary history, by Isaac Disraeli, completed in 1841.

AM′ENO′PHIS (Egypt. *Amen-hôtep*, Ammon is pleased). The name of four Pharaohs of the eighteenth dynasty.

Amenophis I., the second king of this dynasty, son of Amasis I. He reigned for ten years, from about 1570 B.C. He carried on some insignificant wars in Nubia, and against the Libyans on the northwest frontier of Egypt. After his early death he was revered as the patron of the Theban necropolis, and, together with his mother, Nofretari, received divine honors. His mummy, found at Dair el-Bahri, is now in the museum of Gizeh.

Amenophis II. He reigned for some twenty-five years, from about 1450 B.C., waged energetic wars in Syria, and maintained the territory inherited from his father, Thothmes III., in Asia and Ethiopia.

Amenophis III. Son of Thothmes IV. He reigned for thirty-six years, from about 1410 B.C. In the early part of his reign he seems to have warred in Asia, but later he did little to maintain his Syrian provinces. The Amarna Letters (q.v.) show that in his reign, and in that of his successor, the Egyptian supremacy in Asia was seriously threatened. Amenophis is noted for his activity as a builder. He erected in Thebes a gigantic temple; but of this nothing remains except the two colossi at the entrance, one of which, in classical times, became famous as "the vocal Memnon." The Amarna Letters record the fact that Amenophis married Gilukhepa, sister of King Dushratta of Mitani in northern Mesopotamia. His principal wife (whom he commemorates on his monuments), Teye, was a foreigner. The magnificent tomb of her parents, Thua and Yua, was discovered in 1905 by Mr. Davis.

Amenophis IV. The Napkhururiya (Egyptian Nefer-Khoper-re) of the Amarna Tablets. This monarch is one of the most interesting characters in Egyptian history, because of the great religious reform which he attempted. He endeavored to supersede the old polytheistic religion of Egypt by the exclusive worship of the Sun. But his fanatical efforts in this direction, his persecution of the cult of the Theban god Ammon, and the shifting of his residence to Tel-el-Amarna, led to no permanent results. After his reign of eighteen years (beginning about 1375 B.C.), his innovations were abolished, and the old religion was again triumphant. By his wife Nefer-titi he had six daughters.

AMEN′ORRHŒ′A (Gk. *ἀ*, *a*, priv. + *μήν* *mēn*, month + *ῥοία*, *rhoia*, flow, flux). The suspension from any cause other than pregnancy, or the menopause, of the catamenial flow. It is generally an indication of functional disturbance, and is to be regarded as a symptom rather than as a malady. It is frequently an accompaniment of anæmia (q.v.), and due to poverty of the blood. It very often is an early symptom of an impending chronic malady, such as tuberculosis. In both these cases the treatment adopted should be one tending to strengthen the general health; the diet should be nourishing and generous, iron and arsenic should be administered, the bowels should be carefully regulated, and the patient should take mild exercise in the sunlight. See Emmenagogue; Menstruation.

A′MENT (Lat. *amentum*, strap or thong), or **CAT′KIN.** A flower-cluster in which simple flowers are developed upon an elongated axis, and are subtended and more or less concealed by conspicuous bracts. Such clusters are found in the birches, alders, willows, etc., which, in consequence, are often called Amentiferæ. See Inflorescence.

A′MENT, William Scott (1851—). An American missionary in China. He was born at Owosso, Mich., of Dutch descent, and educated at Oberlin, and at Union (N. Y.) and Andover theological seminaries. He went to China as a missionary of the American Board, and was stationed in Peking, where, in the summer of 1900, he was one of the eight hundred foreigners and three thousand native Christians who were besieged. When the siege was raised, Dr. Ament, with the missionaries of his station and 500 native Christians, took possession of the deserted premises of a lesser Mongol prince who had become a fugitive. They acted as intermediaries in reëstablishing the native Christians, and in some of the economic readjustments made necessary by the outbreak; but subsequently they were severely criticised by many of the American newspapers, which accused them of having been morally guilty of looting. This charge was strenuously denied by all the missionaries and their supporters.

AMEN′THES. The Greek form of the Egyptian *Amente*[*t*], "the Lower World," or realm of departed spirits. The word signifies, literally, "the Western (World)," as the mysterious abode of the dead was supposed to lie beneath the western horizon. The graves of the ancient Egyptians were situated in the desert on the western side of the Nile, and the souls of the dead were believed to pass, with the setting sun, through the gates of Amenthes, where, after many perils, they appeared before Osiris (q.v.) and his forty-two assessors to undergo final judgment. The views of the Egyptians in regard to the life of the soul in the nether world were manifold. Plutarch defined Amenthes as meaning "giving and taking," and it is sometimes derived from *amen*, "hidden," but such etymologies are valueless. See also Anubis; Set; Athor.

AMERBACH, ä̆′mẽr-bäG, Johann (1443-1513). A German printer, educated in Paris. He established a press at Basel, publishing the works of St. Ambrose and St. Augustine, and began to publish those of St. Jerome, which were finished by his son Boniface. He was one of the first to use Roman instead of Gothic letters.

AMERCE'MENT (Angl. Fr. *amerciment*, from *amercier*, to be at the mercy of). In old English law, a pecuniary penalty imposed for crime or for the violation of the fealty which the freeholder owed his lord. It was imposed as the result of a judicial conviction of the offense charged, but differed from a fine in that it was a commutation of a sentence of forfeiture of goods, while the fine was a commutation of a sentence of imprisonment of the person. The decree of the court was that the offender was at the mercy (*in misericordia, à merci*) of the king, the sheriff, or the lord in whose court the judgment was rendered. The amount of the amercement, originally unlimited, as the term implies, was regulated by a provision of Magna Charta (1215), which decreed that all amercements should be set, or fixed, by good men of the neighborhood, the peers of the offender, and that the amount should vary with the gravity of the offense. Consult Pollock and Maitland, *History of English Law*, second edition (London and Boston, 1899). See CRIMINAL LAW; FINE; PUNISHMENT.

AME'RIA. The ancient name of Amelia (q.v.), a city in Italy.

AMER'ICA (named after Amerigo Vespucci, an Italian navigator). America, or the New World, is one of the great land divisions of the earth. It has a meridional extent of about 9000 miles, stretching from 72° N. lat. (Boothia Felix) to 56° S. lat. (Cape Horn), without including the Arctic islands. Its extreme northern part extends far within the Arctic Circle, while on the south it stretches to the border of the Antarctic Ocean. Excluding its islands, it lies between the meridians of 34° and 168° west of Greenwich, and has a maximum breadth of about 3300 miles. The entire area is estimated to be 16,000,000 square miles.

GENERAL FEATURES. The New World differs from the Old in size, having about half its area. It differs also greatly in outline, in location on the earth's surface, and in the character of its coasts and its relief. The Old World has, very roughly, a triangular form; while the New World consists of two triangles connected with each other. While both grand divisions lie mainly north of the equator, a greater proportion of the Old World is in the northern hemisphere. The coasts of the Old World, taken as a whole, are much more broken than the American coasts. The principal relief feature of the Old World is a great stretch of elevated land crossing most of Europe and Asia in an east and west direction, while the backbone of America traverses its length in a direction nearly north and south, near its western coast.

America is bounded on the north by the Arctic Ocean, on the south by the Antarctic, on the east by the Atlantic, and on the west by the Pacific. While stretching from one polar ocean to the other, it separates the Atlantic and Pacific throughout their whole length. In the extreme northwest it almost touches Asia, from which it is separated by Bering Strait. Very narrow passages separate it from the extensive islands that constitute the Arctic Archipelago of the Western Hemisphere.

PHYSICAL DIVISIONS. America is divided into two continents, North and South America, separated in part by the Caribbean Sea and the Gulf of Mexico, and connected by the narrow Isthmus of Panama, 30 miles in width.

North America has an area of about 8,300,000 square miles, and South America of 7,700,000. The mean altitude above sea level of both continents is not far from 2000 feet.

These two great continents are much alike in some respects, while differing in others. They are both triangular in shape, with the base of the triangle at the north and the opposite apex at the south. Each has its greatest length along meridians, and greatest breadth along parallels of latitude; each has a great mountain system running the whole length of the western side and parallel to it, and a shorter secondary and more disconnected mountain system in the eastern part, also parallel to the coast, the two mountain systems in each case converging toward the lower apex of the continent. In both cases the eastern ranges are the oldest geologically.

While the two American continents thus present certain similarities of configuration, they are very differently placed on the sphere, and thus their climatic differences are marked, and the conditions dependent on climatic influences likewise differ. The broad part of North America lies mainly within the north temperate zone, and only its apex extends into the tropical zone; thus causing a great portion of the continent to be dominated by comparatively low temperature conditions. In South America, on the contrary, the broad part lies within the tropics, and a comparatively small portion of it extends into the temperate zone.

COASTS. With regard to the nature of their coast-lines, North and South America present an extraordinary contrast. North America, in its extreme irregular coast-line and its great peninsulas, is the counterpart of the Eurasiatic continent in the Old World, while South America, with its almost unbroken coast, is the counterpart of Africa. In North America we have the peninsulas of Alaska, Labrador, Nova Scotia, Florida, Yucatan, and Lower California. South America presents but one great peninsula, that of Patagonia. The Atlantic coast of America is far more irregular and broken than that of the Pacific. On the north of North America, Hudson Bay projects far into the interior of Canada, forming a vast inland sea. Farther south, the Gulf of St. Lawrence and the Bay of Fundy form deep indentations. On the Atlantic coast of the United States are several large bays and harbors, Massachusetts Bay, Long Island Sound, Delaware and Chesapeake bays, and Albemarle and Pamlico sounds being among them. The Gulf of Mexico and the Caribbean Sea have many arms, extending into the land, among them the gulfs of Campeachy, Honduras, and Colon.

The Atlantic coast of South America is simpler, the chief indentations being, on the north the gulfs of Darien and Venezuela, on the northeast the estuary of the Amazon, and on the east the harbors of Bahia and Rio de Janeiro, the estuary of the Rio de la Plata, and the gulfs of Blanca, San Matias, and San Jorge, on the Argentine coast.

The west coasts of both continents are in the main extremely simple. Between latitudes 42° S. and 48° N. there are few harbors. In South America, the Gulf of Guayaquil is almost the only indentation of magnitude. South of latitude 42°, S., however, the character of the coast changes to a fiord coast, with many deep, narrow passages and hundreds of islands. Where the two continents meet, the bend of the Pacific coast forms the deep bay of Panama. The west coast of North America south of the parallel of 48° N. is broken deeply only by the Gulf of California and San Francisco Bay, but near the northwest corner of the United States a fiord coast commences with Puget Sound, and extends thence along British Columbia and Alaska to the Aleutian Islands. The Bering Sea coast of Alaska is low, and broken by many indentations, and similar conditions prevail on the Arctic coast.

TOPOGRAPHY. The prominent relief feature of both continents consists in a great system of elevation, stretching along or near the western coast, from Cape Horn in South America to the extreme end of the Alaska peninsula in North America. This is known in South America as the Andean Cordillera, and in North America as the Cordillera. It differs greatly in its different parts, in breadth, height, complexity, and character. In North America the Cordillera are succeeded on the east by a broad valley; east of this valley, and separating it in the south from the Atlantic, is the shorter, smaller, and lower Appalachian system. In South America the succession is somewhat similar. East of the Andes is a broad slope or depression, which in Argentina continues to the Atlantic; but in eastern Brazil and the Guianas the continuity of the eastward slope is broken by numerous short and comparatively low ranges, corresponding roughly with the Appalachians of the northern continent.

NORTH AMERICA. In North America the Cordillera develops its greatest breadth and complexity in the main body of the United States. Here it includes a broad plateau 1000 miles in width, with an elevation of from 5000 to 10,000 feet, on which stand a succession of mountain ranges trending nearly north and south, the highest of which rise to altitudes of from 14,000 to 15,000 feet. The highest of these ranges are in Colorado and California. In the former State are the Front Range, with Long's Peak, 14,271 feet; Gray's Peak, 14,341 feet; Pike's Peak, 14,108 feet; the Sangre de Cristo Range, with Blanca Peak, 14,300 feet; the Park Range, with Mount Lincoln, 14,297 feet; the Sawatch Range, with the Mountain of the Holy Cross, 14,006 feet, Elbert Peak, 14,421 feet, and Mount Harvard, 14,375 feet: and the San Juan Mountains, with Uncompahgre Peak, 14,289 feet, and Mount Wilson, 14,280 feet.

The principal range of California is the Sierra Nevada, with Mount Corcoran, 14,093 feet; Fisherman Peak, 14,448 feet; Mount Whitney, 14,898 feet; and Mount Shasta, an extinct volcano, 14,380 feet. The Cascade Range of Oregon, Washington, and British Columbia is a continuation of the Sierra Nevada in direction, though not in structure, as it is in the main the product of volcanic action, and contains many extinct volcanoes, the highest of these being Mount Rainier, 14,526 feet. Northward in British Columbia the system is not as high nor as broad, but following the coast around through Alaska, it rises in semi-detached groups and ranges, some of which are of great height, culminating in Mount McKinley, north of the head of Cook Inlet, 20,464 feet in height, the highest summit in North America. Another high peak, on the boundary between Alaska and British America, is Mount St. Elias, 18,100 feet above the sea. This was long supposed to be the highest point in North America.

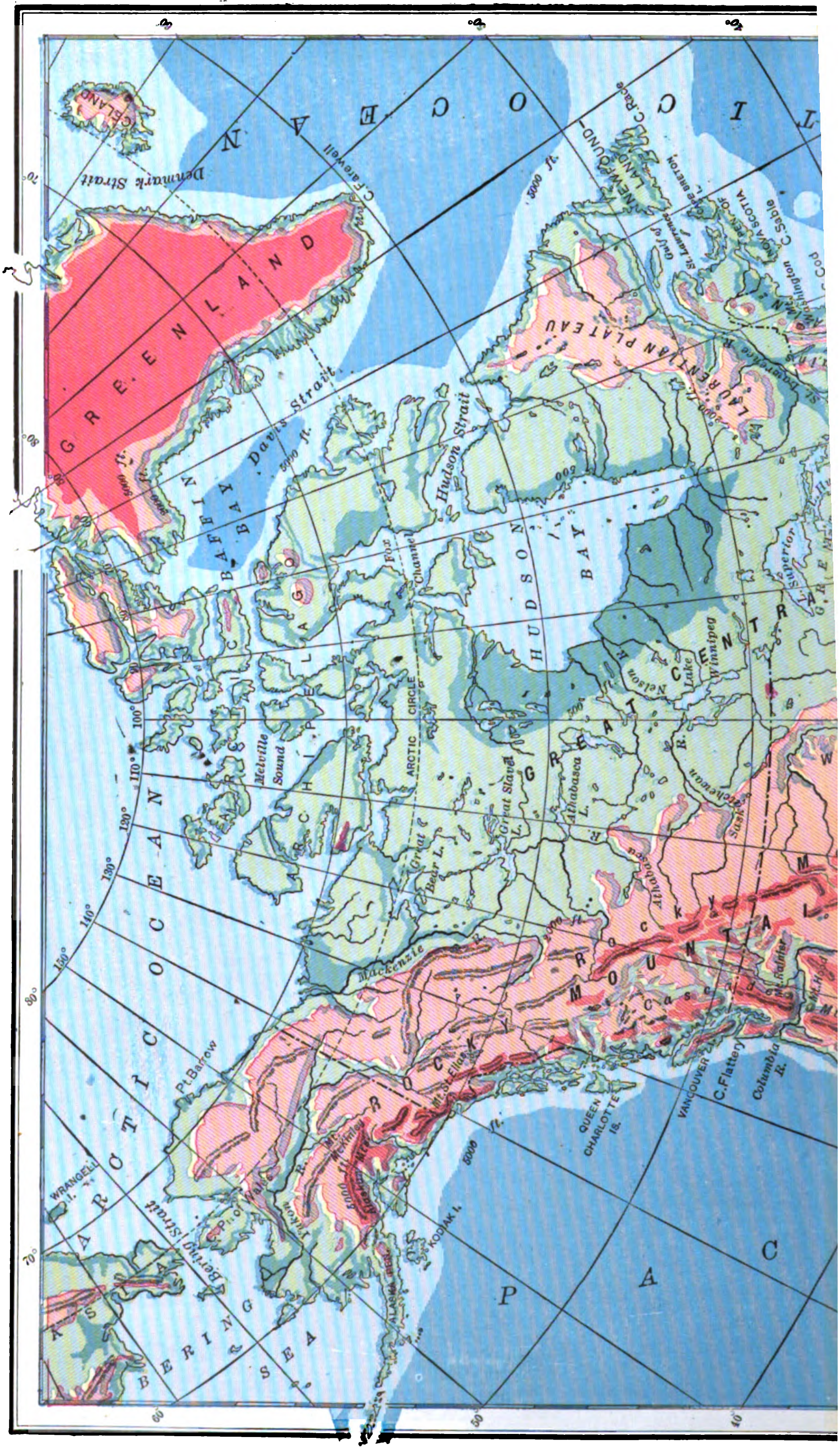
The area of Mexico, with the exception of the State of Yucatan, lies almost entirely within the Cordilleran mountain system. The plateau extends southward into it from the United States, with an elevation ranging from 4000 to 7000 feet. Upon this undulating table-land, which is known as the plateau of Anahuac, are many mountain ranges and many active or dormant volcanoes, the latter being the highest peaks of the country. Among them are Popocatepetl, 17,520 feet; Orizaba, 18,250 feet; Iztaccihuatl, 16,960 feet; Nevada de Toluca, 14,950 feet; and Malinche, 13,460 feet. In the countries of Central America the Cordillera is represented by detached ranges of hills, with numerous volcanic peaks, some of which are active, others extinct.

The depression lying east of the Cordillera stretches in the north to the Atlantic or to Hudson Bay, and in southern Canada and the United States to the Appalachian or Eastern Mountains, with a breadth of 25° of longitude. Over this great area the surface presents no serious variations of level. The only elevations of importance are the Ozark Hills in Arkansas, Southern Missouri, and Indian Territory, with a maximum altitude little over 3000 feet.

The Appalachian Mountains, in a broad sense, extend from the Gaspé Peninsula in southeastern Canada, southwestward through the eastern United States to northern Alabama and Georgia, in a fairly continuous system. They form a narrow plateau, 70 to 200 miles in width and 1500 to 3000 feet in height, which is bordered on the east by the Blue Ridge and on the west by the Alleghany Mountains. In the northern section the line of elevations includes the Green and White Mountains of Vermont and New Hampshire and the Adirondacks of New York, all of which differ more or less in their geological structure from the central and southern portions of the system. The highest summits are Mount Washington in New Hampshire, 6294 feet, and Mount Mitchell in North Carolina, 6707 feet. East of this mountain system the land slopes gently to the Atlantic coast, and is known as the Piedmont Region and the Atlantic Plain. See ROCKY MOUNTAINS; APPALACHIANS, etc.

SOUTH AMERICA. The Cordillera of the Andes follows the western coast of South America in a continuous mountain system from Cape Horn to the Isthmus of Panama, leaving a narrow strip of lowland between its base and the coast nowhere much more than a hundred miles in breadth. In the south the system is narrow and simple, consisting in great part of a single range, which has no great height. Northward it increases in altitude and becomes more complex, reaching a culminating point in the great peak of Aconcagua, in lat. 32° S., which reaches the height of 23,080 feet, the loftiest summit in South America. Still farther north the peaks are not as high, but the system broadens and becomes more complicated by the appearance of ranges in Argentina, east of the Andes proper. In lat. 18° S. the system curves to the northwest, following the coast; here it has a breadth of fully 300 miles, with two, and, in places, three main ranges, and encloses an elevated plateau, on which is situated Lake Titicaca, 12,645 feet high. Near this lake, in the Cordillera Real, are many high peaks, among them Ancohuma, 21,490 feet; Cacaca, 20,250 feet; and Illimani, 21,192 feet.

Still following the coast, the system turns north again at the Gulf of Guayaquil, main-


GREENLAND
ICELAND
Denmark Strait
C. Farewell
Davis Strait
BAFFIN BAY
Hudson Strait
HUDSON BAY
Fox Channel
ARCTIC CIRCLE
ARCTIC ARCHIPELAGO
Melville Sound
ARCTIC OCEAN
NEWFOUNDLAND
C. Race
Gulf of St. Lawrence
C. Breton
NOVA SCOTIA
C. Sable
LAURENTIAN PLATEAU
St. Lawrence R.
L. Superior
Nelson R.
Lake Winnipeg
GREAT CENTRAL
Saskatchewan
Athabasca
Athabasca L.
Great Slave L.
Great Bear L.
Mackenzie
ROCKY MOUNTAINS
Cascade
Mt. Rainier
Mt. Hood
Mt. St. Elias
Mt. McKinley
Pt. Barrow
C. Prince of Wales
Yukon R.
WRANGELL I.
Bering Strait
BERING SEA
ALASKA
KODIAK I.
QUEEN CHARLOTTE IS.
VANCOUVER
C. Flattery
Columbia R.
PACIFIC
ASIA
5000 ft.
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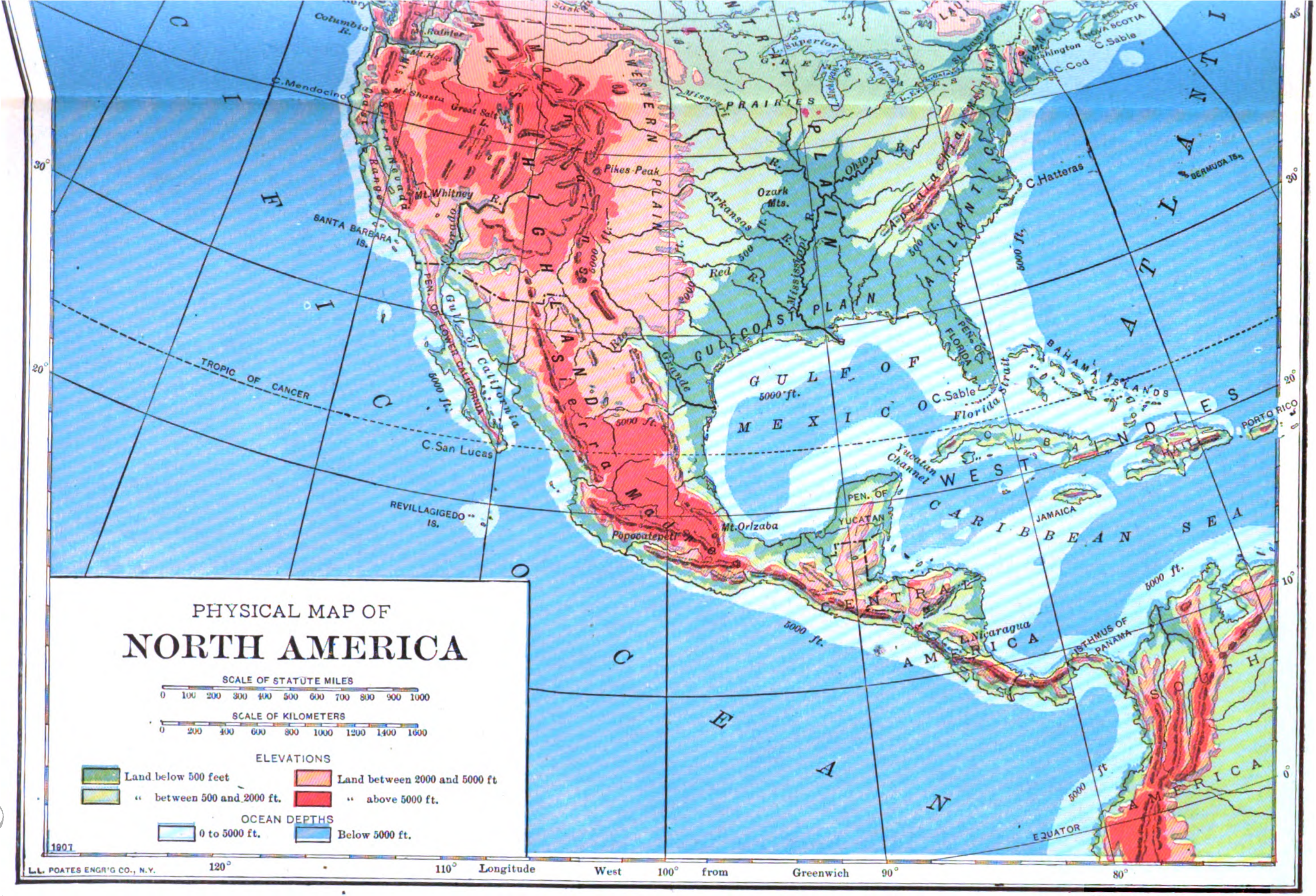

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taining the form of a broad, elevated plateau, bordered by lofty ranges, with many volcanic peaks. In the neighborhood of the equator, in Ecuador, are many notable peaks, among them Tunguragua, 16,690 feet; Cotopaxi, 19,613 feet; Chimborazo, 20,498 feet; Antisana, 19,335 feet; Cayambe, 19,186 feet; and Pichincha, 15,918 feet. From this knot of lofty volcanoes the system falls off in altitude northward toward the Isthmus of Panama and the shores of the Caribbean Sea, splitting into three ranges, which trend away from one another to the north and northeast.

East of the Andes the level of the land descends rapidly to the llanos of the Orinoco, the valley of the Amazon, and the pampas of Argentina. This great area, comprising by far the greater part of South America, is but slightly diversified by hills, forming mainly an immense plain. In eastern Brazil is a mountain system standing on a broad plateau, and composed of many ranges, trending in general parallel to the coast, and having collectively a great breadth. The highest point in this system is Itatiaia, with an altitude of 10,340 feet. A similar but smaller plateau occupies much of the area of the Guianas. See ANDES, etc.

The islands pertaining to this grand division belong mainly to North America. In the Arctic Ocean these land bodies are numerous and large, Greenland, almost continental in area, being the largest of them. West of Greenland, across Smith Sound, is the great extent of Grinnell Land, and south of this island are North Devon, Cockburn Land, and Baffin Land, with many other large islands to the west, including Bathurst, Melville, Prince of Wales, and North Somerset islands, and Prince Albert and Banks Land, the whole forming an extensive archipelago in the Arctic Sea. In Bering Sea, on the northwest of the continent, are many smaller islands, while the chain of the Aleutian Islands, stretching in a great curve, convex southward, from the point of the Alaskan Peninsula, partly separates Bering Sea from the Pacific. On the east side of the continent, the great island of Newfoundland partially closes the mouth of the Gulf of St. Lawrence.

Mainly within the tropics, and lying between the northern coast of South America and the southeast coast of the United States, are the West Indies, with Cuba, Haiti, Jamaica, and Porto Rico, known collectively as the Greater Antilles, and many smaller islands grouped about and stretching away from them. They are the unsubmerged portions of a mountain system. On the north side are the Bahamas, consisting of a large number of small coral islands, and on the southeast, stretching in a broad curve, convex to the east, to the south American coast, are the Lesser Antilles, all small, and many of them of volcanic origin. The best known among them are Guadeloupe, Martinique, and Trinidad. South America has few islands, the Falkland Isles, east of the Strait of Magellan, being the largest, if we except Tierra del Fuego, at the south end of the continent. Off the west coast, and under the equator, are the Galapagos Islands, once prominent as a source of guano.

HYDROGRAPHY. *North America.*—While most of North America is drained into the Atlantic, yet great areas are drained into the Pacific and Arctic oceans. The Rocky Mountains, i.e., the easternmost ranges of the Cordillera, carry the continental divide, and most of the ranges and valleys of this system are drained westward to the Pacific by the Colorado River of the west, through its marvelous cañons to the head of the Gulf of California, by the Sacramento to San Francisco Bay, and by the Columbia, the Fraser, Copper, and other rivers. The northern and northeastern slopes of the system, as well as most of Alaska and much of the Yukon province of Canada, are drained by the great river Yukon to Bering Sea. The northern part of the great central depression of the continent sends its waters to the Arctic Ocean by way of Mackenzie River. Farther south the land is drained to Hudson Bay by the Nelson and other rivers, and to the Atlantic directly by the chain of the great lakes, Superior, Michigan, Huron, Erie, and Ontario, and the River St. Lawrence. The waters of the southern part of this depression are collected by one of the greatest rivers of the earth, the Mississippi, with its branches, the Ohio, Missouri, Arkansas and Red rivers, and are carried to the Gulf of Mexico. The coast-land of the Gulf of Mexico itself is drained by a number of rivers on either side of the Mississippi. The Atlantic slope of the Appalachian mountain system is drained to the Atlantic by many comparatively small rivers.

Besides the great lakes of the St. Lawrence system, North America contains many large bodies of water. In Canada are Great Bear and Great Slave and Athabaska lakes in the Mackenzie River system; lakes Reindeer, Winnipeg, Manitoba, and Lake of the Woods, which are drained to Hudson Bay, and Lake Nepigon, tributary to the St. Lawrence system. In the northern United States are thousands of small lakes, which, in common with those of Canada, were formed by the Laurentian glacier. In the Cordilleran region are many lakes, some of glacial origin, like Pend Oreille and Flathead, others of volcanic origin, like Yellowstone Lake, while many occupy desert valleys and have no outlet, like Great Salt, Carson, and Walker lakes. See YUKON RIVER; MISSISSIPPI, etc.

South America.—South America is for the most part drained into the Atlantic Ocean, the Andes forming a great and continuous watershed; and while three great river systems carry most of the waters to the sea, yet a number of secondary but by no means small rivers aid them in this work. In the extreme northwest of South America, the Magdalena drains the region in which the Andes separate into diverging ranges before their subsidence. The area of its basin is not great, but the enormous rainfall sends great volumes of water through this river channel into the Caribbean Sea. The entire length of the Magdalena, independent of its windings, is not over 700 miles. The great valley at the extreme north of South America, lying between the Andes on the west and the plateau of Guiana on the east, is drained by the Orinoco, which, although not more than 1200 or 1400 miles long, not counting the windings, carries an immense volume of water into the Atlantic, because it, too, lies almost wholly within the belt of excessive rains. Between the Orinoco and the Amazon there are a number of short rivers draining the plateau of Guiana, and heading chiefly in the watershed between this section and the valley of the Amazon on the south. Next in order, proceeding southward on the

Atlantic coast, is the mighty Amazon itself, whose system drains the great valley included between the plateau of Brazil on the southeast, the plateau of Guiana on the north, the Andes on the west, and the highlands of the Cordillera Geral and Matto Grosso on the south, thus embracing about one-third of South America. The Amazon pours a vastly greater quantity of water into the ocean than any other river on the globe. The plateau of Brazil is drained chiefly by the Tocantins, which flows to the north and empties into the Pará estuary; a number of smaller streams which flow northeast and enter the Atlantic between the mouth of the Pará and Cape St. Roque; the São Francisco, which has a generally northeastern direction, and a few smaller streams which drain the short eastern slopes along the whole extent of coast between the mouth of the São Francisco, lat. 10° S., and the estuary of the Plata, lat. 35° S. The Plata, which receives the waters of the Paraná, Paraguay, and Uruguay, drains the whole of the south central part of South America, from the Amazon watershed in lat. 15° S. to lat. 35° S., and embraced between the coast sierra on the east and the Andes on the west. This great river system has been compared with the Mississippi River system, with which it has certain features in common. South of the Plata are a number of rivers, including the Colorado, Negro, and Chubut. On the Pacific coast the drainage is effected by short, torrential streams scarcely worthy the name of river. See AMAZON; ORINOCO, etc.

GEOLOGY. The geological history of North America, considered in a broad way, is not complex. The oldest part of the continent, the first to be elevated above the sea, is the northeastern section, including the Adirondacks of New York and the Laurentian Highlands of Canada, and a region about the Great Lakes, together with a southward projection just east of the Blue Ridge in the Southern States. This is the Archæan area. From this, as a nucleus, the continent grew westward, as is indicated by the surface formations, which become successively more recent. The eastern portions of the Appalachians are in great part composed of Silurian beds. The plateau forming the western part of the system is Carboniferous, which formation also underlies much of the Mississippi Valley. The great plains which form the eastward slope of the Cordilleran plateau are floored, in westward succession, by Triassic, Cretaceous, and Tertiary beds.

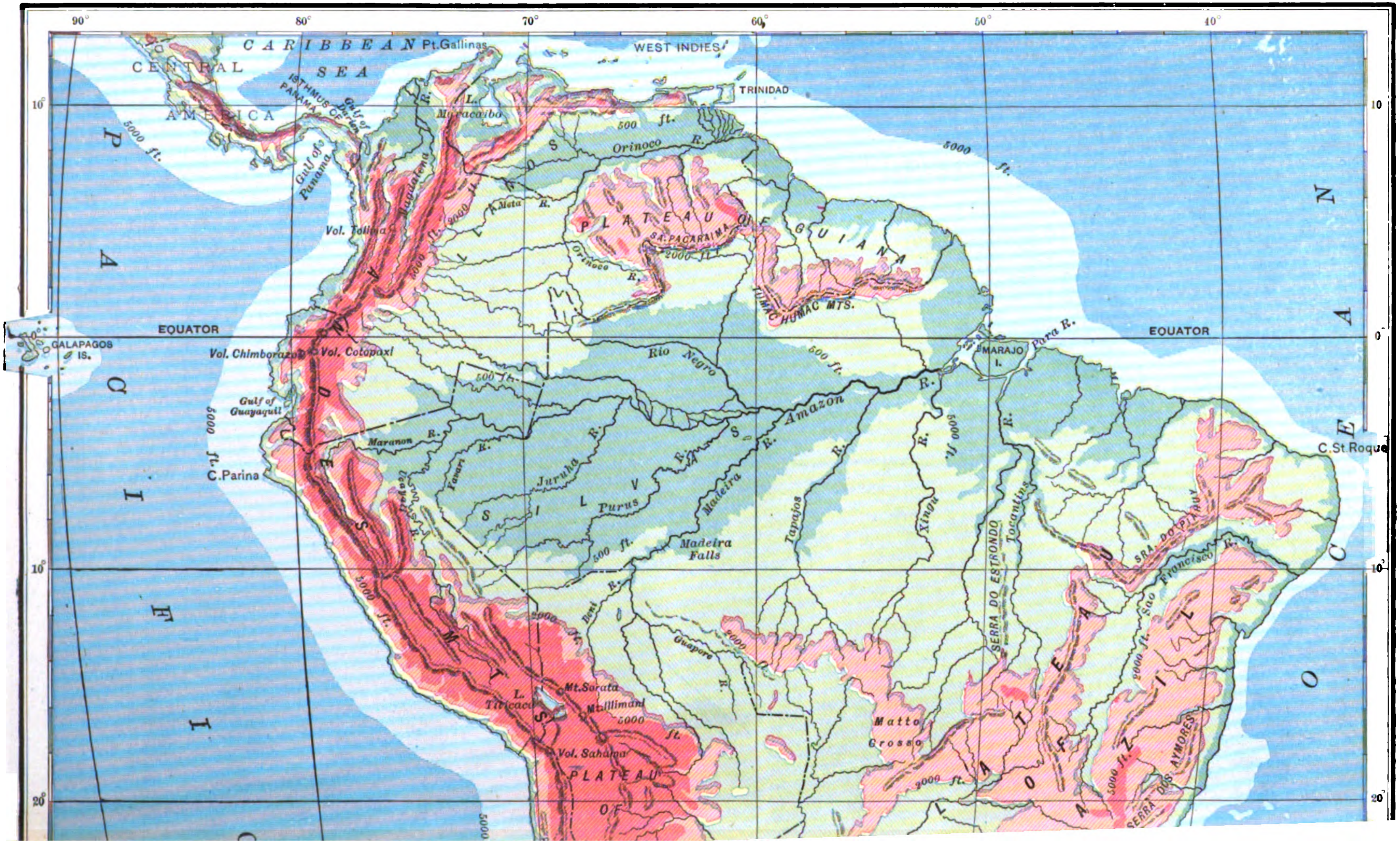
The mountains of the Cordilleran system are mainly of recent formation, and show strata of all ages, as they have been much disturbed by uplift, and the beds exposed by subsequent erosion. Upon the mountains granitic rocks largely predominate, as the stratified beds which formerly covered them have been eroded away, while in very many cases these stratified beds still remain on the flanks of the ranges, as hog-back ridges. The valleys are often partially filled with detritus from the mountains. In this region many great areas have been covered by outflows of lava, some of them in very recent times. The regions bordering the coasts of the Atlantic and the Gulf of Mexico are floored with Cretaceous and Tertiary deposits, indicating their comparatively recent uplift. There are no active volcanoes in the United States proper or in Canada. Within historical times eruptions have been reported on the coast of Alaska, and several peaks on that coast are still smoking. In Mexico, Central America, and the West Indies there are many active volcanoes. See Geology under UNITED STATES; CANADA, etc.

South America.—The eastern highlands are of Archæan and Paleozoic formations, with a superimposed layer of sandstone. No subsequent submergence has occurred, and no folding has taken place since Paleozoic times, so that no recent marine deposits have been made, and the deep valleys are due to erosion rather than to irregular faulting, the rock layers lying horizontally. These eastern highlands are but the remains of a great mountain system which has been worn away to the existing condition in the filling up of the plains below, to which they have contributed their material. The western highlands (see ANDES), while of more recent origin than the eastern, are made up of ranges differing in geologic age. Most of the great peaks of the Andes are of volcanic origin, and many of them are still active, or have been eruptive in recent and historic times. The lowlands east of the Andes are, so far as known, floored with Tertiary deposits, with broad bands of alluvium bordering the larger streams. See Geology under BRAZIL; ARGENTINA, etc.

GLACIATION. In recent geologic times nearly all of Canada and much of the United States was covered by a great sheet of ice, the Laurentian glacier. In the United States it covered New England and New York, extended southward to the Ohio River, and westward to the Missouri. Throughout this area the surface has been modified by erosion and deposition by ice. Stream courses have been changed, countless lake basins have been formed, and the surface covered with drumlins, kames, and other morainal deposits. In the northern part of the Cordillera, evidences of former glaciation are everywhere abundant, and in the higher ranges many glaciers still exist. Indeed, in the mountains on the Alaska coast, where the precipitation is profuse, there are many glaciers of great magnitude, some of which reach the sea. The Muir Glacier covers fully a thousand square miles, and there are others of equal size. Even these great glaciers, however, are but the much reduced relics of far larger ones, which covered the coast and eroded the fiords which intersect it.

In South America the glacial history, so far as known, is confined to the Andes. Most of the higher peaks, even those under the equator, have glaciers upon their upper slopes, while in the southern portion of the system glaciers are extremely abundant, and the configuration of the land shows that in past time they covered it, lying in every gorge and fiord, which are evidently products of ice erosion.

CLIMATE. Stretching from the south temperate zone through the tropics to the north polar zone, America has many climates, dependent upon latitude, prevailing winds, and the distribution of the relief features. The main body of North America is principally within the region of the anti-trades or prevailing westerlies. These winds give to the western coast of the United States and Canada, and to southeastern Alaska, an insular climate, with great uniformity of temperature and a heavy rainfall. Their influence extends inland but a short distance, owing to the mountain ranges which border this coast, and the rest of the United States and Canada have a


90°
80°
70°
60°
50°
40°
10°
0°
20°
CARIBBEAN SEA
Pt.Gallinas
WEST INDIES
TRINIDAD
CENTRAL AMERICA
ISTHMUS OF PANAMA
Gulf of Darien
Gulf of Panama
L. Maracaibo
Magdalena
Orinoco R.
LLANOS
Meta R.
500 ft.
2000 ft.
5000 ft.
PLATEAU OF GUIANA
SA. PACARAIMA
Orinoco R.
TUMAC HUMAC MTS.
Vol. Tolima
EQUATOR
GALAPAGOS IS.
Vol. Chimborazo
Vol. Cotopaxi
Gulf of Guayaquil
C.Parina
Maranon R.
ANDES
Rio Negro
Amazon R.
Para R.
MARAJO I.
SELVAS
Yavari R.
Jurua R.
Purus R.
Madeira R.
Madeira Falls
Tapajos R.
Xingu R.
Tocantins R.
SERRA DO ESTRONDO
SRA. DO PIAHUY
Sao Francisco R.
C.St.Roque
Ucayali R.
Beni R.
Guapore R.
Mt.Sorata
Mt.Illimani
L. Titicaca
Vol. Sahama
PLATEAU OF
Matto Grosso
PLATEAU OF BRAZIL
SERRA DOS AYMORES
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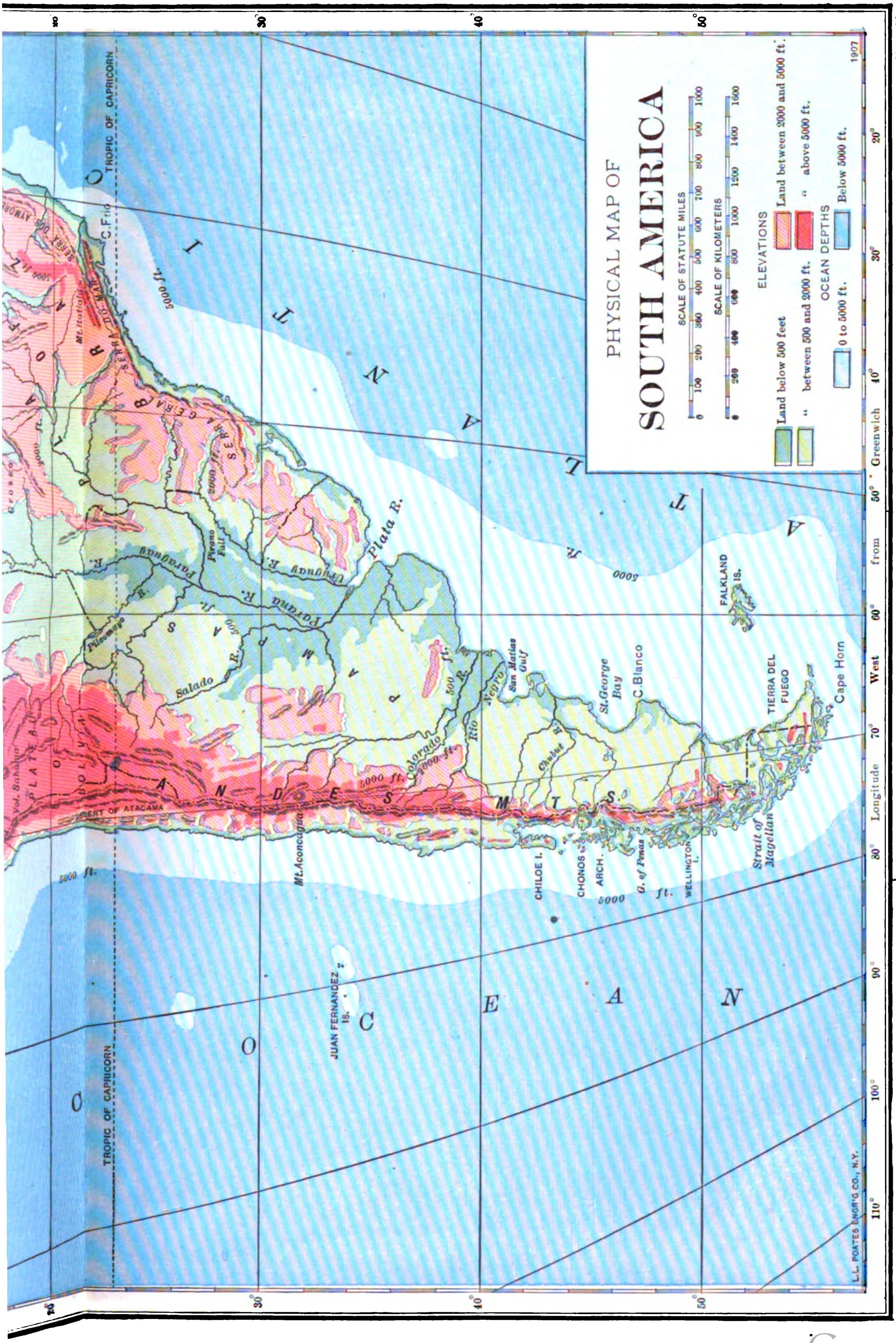

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continental climate with much greater extremes of temperature; the Cordilleran region, which is dependent upon the Pacific as its source of precipitation, has an arid climate; but in the east, where the Gulf of Mexico and the Atlantic serve as sources of supply, the rainfall is ample.

Central America is within the region of the trade winds, and has measurably an insular climate, owing to the narrowness of the land. That portion of South America which lies in the tropics, over which the trade winds blow continuously from the east, has a warm, moist climate and a heavy rainfall. This region is limited on the west by the Andes, over whose wall none of the moisture from the Atlantic can pass. Hence, most of the Pacific coast of South America within the tropics is a desert. In Chile and Argentina the conditions prevailing in North America are duplicated. Here in the south temperate zone the prevailing westerly winds bring to the western coast the mild, saturated atmosphere of the Pacific. The temperature is uniform throughout the year and the rainfall heavy; while east of the Andes the westerly winds, deprived of their moisture in crossing the mountains, blow dry over the land, and the semi-desert pampas are the result.

North America.—The mean annual temperature ranges from 80° F. in Central America down to 5° on the Arctic coast, and except on the Pacific coast the temperature decreases quite regularly with the latitude. On the Pacific coast the reduction in temperature with increase in latitude is much less rapid. At San Diego, on the southern boundary of the United States, the mean annual temperature is about 70°, while the Alaska coast, even as far north as Prince William Sound, has a temperature only 30° lower, and 20° higher than in the same latitude on the Labrador coast. This measures the effect of the ocean in ameliorating the mean annual temperature.

In midwinter (January) the temperature ranges from 80° in the south to —25° on the Arctic coast. Here again the reduction with increasing latitude is much less on the Pacific coast than in the interior or on the Atlantic coast. The coast of southern Alaska is 30° warmer than that of Labrador in approximately the same latitude. The midsummer (July) temperature is highest on the arid plateau of northern Mexico and in southern Arizona, where it reaches 95°. Thence it diminishes in all directions, sharply to the west as the Pacific coast is neared, and much more gradually northward and eastward. The range of summer temperature between San Diego and the Aleutian Islands is but 20°, from 70° to 50°, while in the eastern part of the continent its range is from 80° to 40°, and in the Cordilleran region from 95° to 40°. In this latter region extreme heat as well as extreme cold is frequently encountered; in southern Arizona temperatures of 120° have been recorded, and 100° as far north as latitude 60°. On the Pacific coast the range of temperature between midsummer and midwinter (July and January) seldom exceeds 20°, while upon the Atlantic coast the corresponding range is nearly twice as great, and in the Cordilleran region it is in many places three times as great.

The distribution of rainfall over North America depends upon the configuration and relief of the land and on the direction of the winds. In the region of the trade winds the rainfall is very heavy, 200 inches at Panama, and diminishing northward. In the region of the anti-trades, the Pacific coast receives nearly all the moisture brought by these winds from the Pacific, and here the amount and distribution of the rainfall are radically affected by the relative temperatures of land and sea. Where and when the land is colder than the sea, moisture is condensed from the air currents and falls in rain; the rainfall is therefore heavy on the northern part of this coast and light on the southern part, and is heavy in winter and light or entirely absent in summer.

At San Diego the rainfall, even in winter, is very light, while at Puget Sound it has increased to from 75 to 100 inches, and has an average along the Alaska Pacific coast of about 90 inches annually, most of which falls in winter. Air currents from the Pacific, deprived of most of their moisture in passing over the mountain ranges near the Pacific coast, flow over the Cordilleran region during most of the year as dry winds. In the summer, however, they retain a little moisture, which they give up to the high ranges of the interior. Hence, this region, which is upon the whole desert, or semi-desert, receives most of its scanty supply of rain, 20 inches or less, in the summer time.

Moving eastward, this general air movement from west to east, which commonly takes the form of great cyclones or anti-cyclones, draws air currents from all directions. These, coming off the Gulf of Mexico, are saturated with moisture, and cooling as they go northward, give rain to the land. Thus the great depression of the continent is watered in the main from the Gulf of Mexico, the rainfall ranging from 60 inches on the coast to 30 inches in the region of the Great Lakes and Hudson Bay. These cyclonic disturbances, as they approach the Atlantic, draw saturated air currents in from that ocean, and from that source of moisture the Atlantic coast is watered, the amount of rainfall ranging from 50 to 40 inches.

South America.—The southern continent has no such range of temperature as North America, since it lies on both sides of the equator. The annual temperature ranges from 80° to 40°, the highest temperature being in the northern part. The midwinter (July) temperature ranges from about 80° in the north to 35° in the south, and the midsummer temperature from 85° to 50°, the highest being in the interior, in northern Argentina. On the southern part of the west coast of South America, where the prevailing winds are from the west, the temperature is moderated by them as on the western coast of North America, making the winter temperature higher and the summer temperature lower. The greatest range between summer and winter is found in northern Argentina, a region corresponding in situation to the Cordilleran region in North America. Here the range between the hottest and coldest months is from 25° to 30°.

The great Amazon basin, lying within the tropics, is abundantly watered by the trade winds which come to it saturated from the Atlantic. The rainfall over this great area is estimated at from 50 to 75 inches, and in some parts is 150 to 200 inches. This heavy rainfall extends to the foot of the Andes, and even up its abrupt eastern slopes. The air currents, thus deprived of their moisture, descend the western slope as dry winds, and the narrow western base of the range receives little moisture. Farther south, in southern Chile and Argentina, the conditions are reversed. The westerly winds bring rain to the narrow strip of land on the west coast, which receives as much as 80 inches in certain localities, and the pampas on the east receive very little, on account of the intercepting mountains.

FLORA. *North America.*—The flora of North America is varied, ranging from those plants peculiar to Arctic regions to those of the tropics. In the extreme northern part of Canada and Alaska, where the ground is constantly frozen, thawing only on the surface in the summer, and forming the well known tundra, the prevailing plant life consists of reindeer moss, with a few dwarf Arctic willows. But in the short, hot summers of this region even the tundra is gay with bright-colored blossoms. Near the Arctic Circle forests of spruce, with some birch and alders, appear, at first in scattering clumps, then more continuously. Thence southward as far as the North Saskatchewan River, in Canada, the land is forested with coniferous trees, spruce, pine, fir, and hemlock. This timbered area extends southward along the Pacific coast nearly to San Francisco Bay. In Washington, Oregon, and California exist probably the heaviest forests in the world, consisting entirely of coniferæ, great firs, sugar pines, redwoods, and the giant sequoia, the largest and the oldest living thing.

Eastern Canada and the United States are forested, the western limit including most of Minnesota, Wisconsin, and Indiana, southern Missouri, the eastern part of Indian Territory, and northeastern Texas. In the central United States, the prevalent species change to hard woods, while in the Southern States yellow pine becomes the dominant species. West of this forested region in the United States and Canada is the prairie region, once grassed, and with groves of timber, now highly cultivated, which passes by insensible degrees into the treeless plains which form the eastern slope of the Cordilleran plateau.

In the Cordilleran region forests are, as a rule, found only on the mountains, and consist mainly of coniferæ. The valley vegetation depends upon the degree of aridity; here may be found grass, artemisia, cacti, yucca, and other thorny desert shrubs, which in some localities grow so densely as to form what is called chaparral. The northern plateau region of Mexico is without forests, except upon the higher ranges, while the southern and lower part of the country, with Central America, has a tropical profusion of fruit and vegetation. See Flora under ROCKY MOUNTAINS; CANADA; UNITED STATES; MEXICO; NICARAGUA, etc.

South America.—The flora of South America ranges from that of the tropical to that of the temperate zone, and is controlled not only by latitude, but by altitude and rainfall. At the extreme north in Colombia, on the waters of the Magdalena, the hot climate and excessive rainfall produce a luxuriant vegetation which changes from its tropical character only with great change of altitude above the sea, palms, bamboos, and tree ferns forming much of the lower forests, and coniferæ higher on the mountains. To the east of this region are the llanos of the Orinoco, with their tall grasses and isolated trees. To the south of these, east of the Andes, are the great selvas of the Amazon, with their rich forests and mixed flora. Directly south of these occur the great forests of the Matto Grosso, to the east of which lie the Catinga woodlands and the Brazilian campos, with their thickets interspersed with open glades. To the west of the Matto Grosso lies the great mountain of southwestern Brazil and Bolivia. To the south of the Matto Grosso lies the Gran Chaco, with its wax palms and other rich forest growth. Still farther south begins the plains or pampas of the Plata, which, at first consisting of rich grasses, soon degenerate into the dry plains of southern Argentina, with their stunted and poor plant growth. The flora of the western strip of South America, which includes the Andean regions, is in general tropical or sub-tropical at low levels, and changes in altitudinal zones with increase of height above the sea level, but is much modified by the distribution of rainfall throughout the length of the continent, which permits of an abundant vegetable growth in the northern and southern portions, but greatly limits it in the intervening region of little rainfall. The potato is indigenous to South America. See Flora under ANDES; COLOMBIA; ECUADOR; PERU; BOLIVIA; CHILE; AMAZON; BRAZIL, and ARGENTINA.

FAUNA. In considering this subject, it must be recognized first that we here have to deal with two continental faunæ, for the animal life of North America is almost completely different from that of South and Central America. This unlikeness seems related in large degree to history and derivation. The fauna of North America is very similar to that of the northern zones of the Old World, in large part identical with it. Among mammals substantially similar to those of Europe or northern Asia are all the bears, wolves, the lynx, most fur-bearers (*Mustelidæ*), the bison, reindeer, moose ("elk" of Europe), bighorn, white goat, beaver, and the majority of the rodents and small insectivores, bats, etc., where the differences are rarely more than generic. The peculiar North American mammals of note are the puma, the skunk, the pronghorn, the musk-ox, and certain rodents, as the pouched-rats and sewellel. The absentees are equally interesting. Although they arose in Tertiary North America, no horses, camels, or rhinoceroses are in its recent fauna; nor any true antelopes or swine (except in the extreme southwest); of Marsupials a single form, the opossum, is present. The birds present a similar parallelism with northern Europe and Asia, many species, and nearly all the families, being common to both continents. The same is true of reptiles and amphibians, which are marked in North America by the preponderance of certain subordinate forms, such as the rattlesnakes, rather than by anything very different from those of the Old World. Fishes present somewhat greater distinctions, yet the bulk of fresh-water fish are similar to, and some are identical with, those of the colder parts of Europe. Insects and fresh-water mollusks seem generally related to those of Europe and Asia; but the United States is richer than any other part of the world in fluviatile mollusks—especially river mussels (*Unionidæ*). On the whole, the Nearctic fauna is closely allied to the Palæarctic, and by some students they are united in a single grand division, termed "Holarctic," or "Triarctic."

South America, considered with reference to its fauna, includes Central America, the lowlands of Mexico, and the West Indies, and forms one of the grand zoögeographical divisions, named "Neotropical" by Sclater. It is characterized by richness and isolation, leading to the belief that its union with North America has been accomplished at a comparatively recent date, and that the origin of its animal population is exceedingly remote and was followed by long isolation. It has eight families of mammals absolutely confined to it, including two families of monkeys, markedly different from those of the Old World (but no lemurs), the bloodsucking bats, and the greater part of the order of Edentates, and many peculiar rodents. The continent has no Mustelidæ nor Viverridæ; only one kind of bear; almost no insectivora; no horses or related animals, except one species of tapir; no ruminants, except the cameloid llamas (not known elsewhere), and only a few small ungulates of any sort. Birds display still greater isolation and singularity when compared with the avifauna of the Old World or of North America. Wallace gives 23 families and 600 genera as exclusively Neotropical, while that continent or its northerly extensions possess the greater part of many other important families, such as the humming-birds (some 400 species), tanagers, and macaws, to which must be added a long list of peculiar sea-fowl. Among reptiles there are less peculiar forms, the boas and scytales being most conspicuous among snakes; but there are several local families of lizards and many genera, the iguanids being widely developed, while the Varanidæ, Lacertidæ, and Agamidæ, so characteristic of the Old World, are entirely absent from America. The Amphibia present a similar case. Fishes of fresh waters are enormously abundant, and their resemblance, as a whole, is to the African piscifauna, while many are survivors of very ancient types, such as lepidosiren. Similar facts might be adduced to show the regional exclusiveness of the insects and other invertebrates. On the whole, South America is characterized by the possession of a very uniformly distributed fauna, far more local and distinct from any other region than that of any other continent, unless it be Australia, probably more than four-fifths of its species being restricted to its zoögeographical boundaries. See DISTRIBUTION OF ANIMALS.

HISTORY.

DISCOVERY. Christopher Columbus, in 1492, added a new world to European commerce and civilization; but there can be little doubt that the Western Hemisphere to which Columbus opened the way had previously been visited by voyagers from the older world. There is nothing inherently impossible in the stories that Japanese or Chinese vessels, blown by storms or carried by the Pacific currents, reached the western coast of North America. The most circumstantial of these tales relates that some Chinese Buddhist priests in the fifth Christian century reached a land of Fu-sang, and successfully returned with the account of their adventures in what some critics have thought was the country now known as Mexico. From Europe the earliest visitors to America came by way of Iceland, and the story of their experiences, though it does not satisfy all the demands of modern historical criticism, may safely be deemed true in its principal details. In 876, Gunnbjörn, a sea rover, while on his way from Norway to the new Norse settlement in Iceland, was blown westward until he sighted an unknown land. A century later, about 985, a restless young Norwegian named Eric the Red succeeded in verifying the stories which had been handed down from Gunnbjörn's time, and in establishing a settlement on the shores of the land to which, with the idea of attracting colonists, he gave the name of Greenland. Two years or so after this, Bjarni Herjulfson, while in command of a ship in which he had set out to visit the Red Eric's settlement, encountered storms that drove him, as he reported, southward until he came in sight of land.

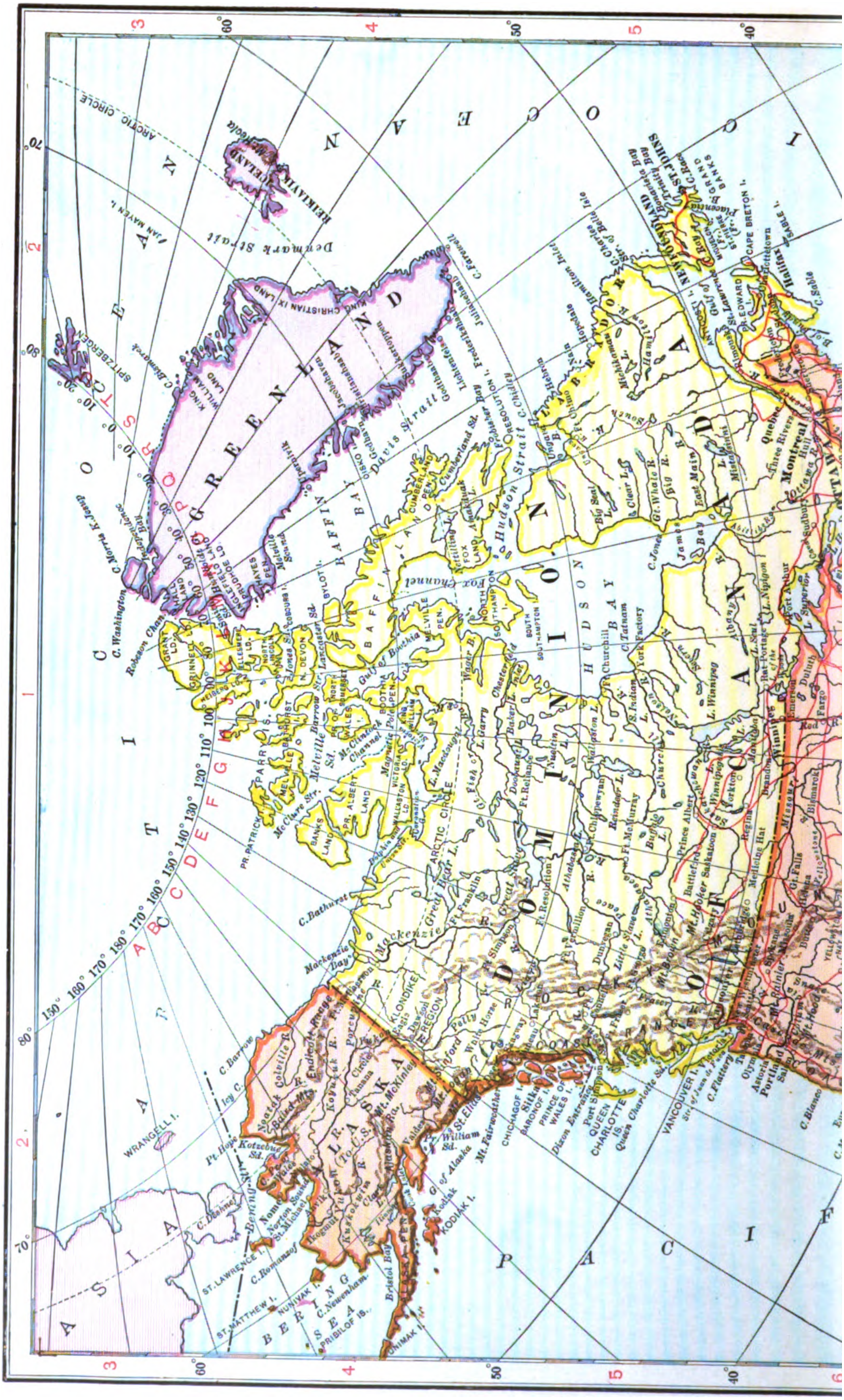
In the year 1000, Leif, Eric's son, started to explore Bjarni's land. He came first to a barren shore backed by ice-covered mountains, a description which suggests Labrador. Sailing south, he met with more pleasant regions, to which he gave the names of Markland and Vinland. Many attempts have been made to identify these localities, and Newfoundland and Nova Scotia perhaps best answer the essential conditions. At Vinland a flourishing settlement was established and maintained for several years, and there Gudrid, the wife of Thorfinn Karlsefne, gave birth, in 1007, to a son, Snorre, from whom the sculptor Thorwaldsen claimed descent. Many localities—Newport and Dighton, on Narragansett Bay; Cambridge and Waltham, on the Charles; Salem, indeed, well-nigh every town situated beside a pleasant river northward from Long Island—have laid claim to this Norse settlement, regarding the actual situation of which, however, nothing certain is known. During the succeeding five hundred years, many voyagers may have crossed the Atlantic, but none of them left any proof of their work. Madoc, son of Owen Gwynnedd, a prince of Wales, is said by Humfrey Lloyd, in a book printed in 1559, to have sailed westward and to have established a transatlantic Welsh colony in 1170. The Venetian brothers Zeno, between 1380 and 1390, probably made a voyage from the Shetland Islands to Iceland and Greenland, and in their letters home to their Italian brethren they seem to have given a picturesque account of what they had learned about the country lying still farther to the southwest. French, Breton, and Basque fishing vessels very likely visited the cod banks in the western Atlantic during the fifteenth century; but if they did, they were careful not to let the information of their valuable discovery reach their rivals.

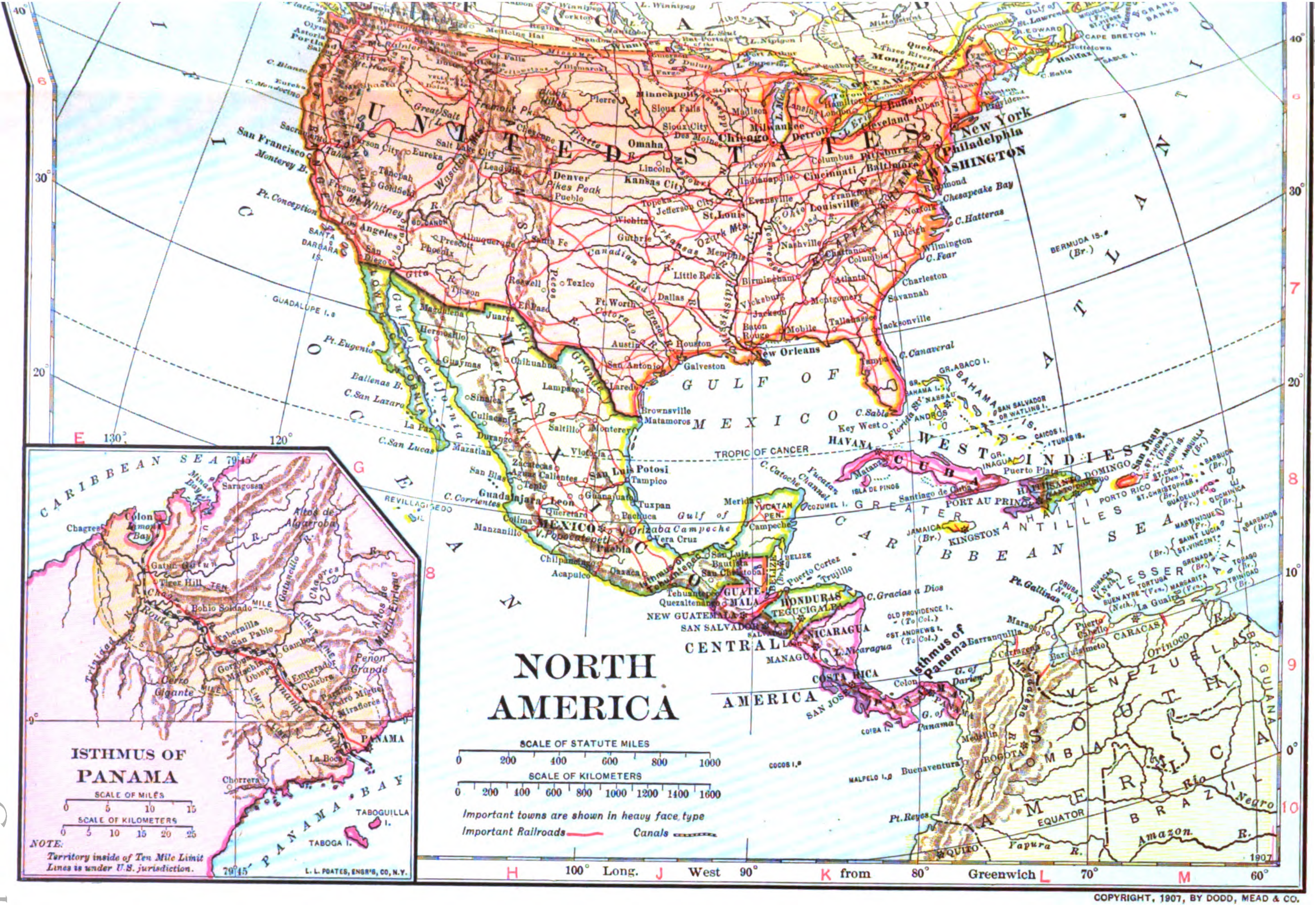
Consecutive discovery and exploration began with the voyage of Christopher Columbus in 1492. (For a full account of his expeditions, see COLUMBUS, CHRISTOPHER.) In 1493 and 1494 Columbus established the main features of the islands in the West Indies. In his third voyage, 1498, he touched at Trinidad, and followed the mainland for some distance; and in 1502-04 he coasted from Yucatan to Venezuela. Meanwhile, in 1497, John Cabot sailed from England, and reached the neighborhood of the Gulf of St. Lawrence; but many years passed before the identity of the land which served as headquarters for the hosts of fishing boats which frequented the Banks with that of the New World of the Spaniards was definitely determined. It appears probable that almost simultaneously with Cabot's landing on the American continent, Pinzon (accompanied by Vespucius) discovered Central America. A succession of voyages now rapidly extended geographical knowledge of the coast line of the Mexican Gulf and northeastern South America. In 1499 Ojeda and Vespucius coasted the northern shores of the southern continent, naming Venezuela, "the little Venice," and uniting this coast with the territory visited by Columbus. Pinzon, early in 1500, reached Brazil, entered the mouth of the Amazon, and crossed the equator, reaching 8° 20′ S. on the Brazil coast. Cabral, in 1500, too, was blown to the same coast while trying to follow the route of Vasco da Gama to the East Indies, and thus established the Portuguese claim to a part of America. Vespucius, transferring his services to Portugal, in 1501 followed the coast from Cabral's Land nearly to the mouth of the Plata. These were the official recorded voyages; but the extent and importance of the information secured by the surreptitious voyagers who were striving to gain a part of whatever the newfound lands had to offer is best shown by the fact that though Cuba was not officially circumnavigated until 1508, by Ocampo, nevertheless, it is represented as an island on La Cosa's map of 1500 and on the Cantino Portuguese map of 1502. As soon as it was realized that a vast land mass still barred the way to India and Japan, the problem of foremost importance became that of finding a water route through or around the western continent. The way was found in 1520 by Fernão Magalhães, commonly known as Magellan. Magalhães sailed so directly for the strait which now bears his name that it has been surmised that he already knew of its probable existence from the captains of merchant vessels who had explored the coast to the extreme south in their search for trading chances. From the western end of the strait, Magalhães laid his course to the East Indies. There, on one of the Philippine Islands, he was killed in April, 1521; but Juan Sebastian del Cano, in command of the *Victòria,* prosecuted the voyage successfully, and reached Seville in September, 1522, by way of the Cape of Good Hope, having circumnavigated the globe for the first time.

The exploration of the interior demanded attention as soon as the main features of the coast had been determined. In 1513 Vasco Nuñez de Balboa ascended one of the peaks in the range which forms the isthmus of Panama, and looked down upon a south sea, to which Magalhães, a few years later, gave the name of Pacific, because of his calm and pleasant passage. Cortes, in 1519, set out from Cuba to investigate the persistent gold rumors from the West, and landed at a port to which he piously gave the name of Vera Cruz. Two years later he had mastered the geography, as well as the people, of Central Mexico, and within the ensuing ten years his captains traversed a large part of the Central American region, reaching the Pacific by several routes. In 1527 Cortes built a fleet on the western coast, which he dispatched to the Moluccas under Alvaro de Saavedra, for the purpose of coöperating with an expedition commanded by Sebastian Cabot, who had, however, turned aside from his original purpose of sailing to the East Indies by way of the Strait of Magellan, and was spending three years in ascending nearly to the head waters of the Plata. In 1536 Cortes found Lower California, which was supposed to be an island until, in 1540, Alarcón proved its continuity with the mainland by his trip up the Rio Colorado of the West. Similarly, in 1512, Ponce de Leon discovered the "island" of Florida, which Pineda, in 1519, definitely connected with the continent by a voyage along the coast from Florida to Vera Cruz. Ponce de Leon was followed by Narvaez, Cabeza de Vaca, and Fernando de Soto, whose explorations, combined with that of Vasquez Coronado from Mexico to the Kansas-Nebraska prairies, had, by 1545, made known the principal features of central North America south of the Missouri and Ohio rivers.

Francisco Pizarro was the successful discoverer of the truth in the reports of a rich land southward from Panama, of which the settlers had heard from the time of their first visit to the isthmus. Between 1531 and 1534 Pizarro brought the Inca Empire of Peru within the limits of the known world, while his associate, Diego de Almagro, pushed on farther south into the plateau of northern Chile. Gonzalez Pizarro, in 1540-41, crossed the Andes and reached the head waters of the Amazon, which one of his companions, Francisco de Orellana, followed down to its mouth, reaching the sea in August, 1541. The reports of a large river in the northeastern part of the southern continent caused much confusion in the handiwork of European map-makers, and it was a long while before they succeeded in evolving two distinct river systems. It is often quite impossible to determine from the narratives of early explorers in the interior whether they are describing the Orinoco or the Amazon. The latter was known at first as the Marañon or the Orellana; but the name given by the tribe of female warriors supposed to live near it eventually became the accepted designation. The other great river system, that of the Plata, was first visited in 1515 by De Solis, whose name clung to it for several years, until after the explorations of Sebastian Cabot and Diego Garcia in 1527-30. The only remaining section of South America, from the Strait of Magellan northward to Chile, which had been explored to 40° south by Valdivia in 1540, is not known to have been visited until the latter part of the century, when Drake and his fellow freebooters undertook to tap the sources of Spanish wealth. Drake started off on a mission of vengeance for the injuries he had brought upon himself in the West Indies in the winter of 1577-78. Sailing through the Strait of Magellan, he followed up the west coast, plundering as he went, until he had filled his vessels with Spanish treasure. Learning that his enemies were watching to attack him when he should return through the strait, Drake decided to seek some other way home to England. He tried first for a northwest passage; but the season was not propitious, and after visiting the California coast and annexing it to the British crown under the name of New Albion, he turned westward and completed the first English circumnavigation in 1580.

John Cabot showed the way to the Newfoundland Banks, and it is probable that English, Breton, and Basque fishermen visited the neighboring coasts regularly from the very beginning of the sixteenth century. They added little, however, to the general geographical knowledge of the country. Gaspar de Cortereal visited the St. Lawrence region or the Labrador coast in 1500-01, and Jean Denys of Honfleur was on the Newfoundland coast in 1506. By chance a record of these voyages has been preserved. Many similar


ARCTIC OCEAN
GREENLAND
ICELAND
SPITZBERGEN
JAN MAYEN I.
Denmark Strait
BAFFIN BAY
Davis Strait
Hudson Strait
HUDSON BAY
James Bay
Fox Channel
BAFFIN LAND
LABRADOR
NEWFOUNDLAND
DOMINION OF CANADA
ALASKA
KLONDIKE REGION
ASIA
BERING SEA
Bering Str.
WRANGELL I.
ST. LAWRENCE I.
ST. MATTHEW I.
NUNIVAK I.
PRIBILOF IS.
KODIAK I.
UNIMAK I.
G. of Alaska
P A C I F
O C E A N
ARCTIC CIRCLE
BANKS LAND
VICTORIA LD.
PR. ALBERT LAND
MELVILLE
Melville Sd.
McClure Str.
Barrow Str.
Lancaster Sd.
N. DEVON
Jones Sd.
GRINNELL LD.
GRANT LD.
Robeson Chan.
C. Washington
Mackenzie Bay
C. Bathurst
Great Bear L.
Great Slave L.
L. Athabaska
L. Winnipeg
L. Superior
Quebec
Montreal
OTTAWA
Halifax
CAPE BRETON I.
PR. EDWARD I.
ST. JOHNS
VANCOUVER I.
QUEEN CHARLOTTE IS.
Mt. McKinley
Mt. St. Elias
Mt. Brown
Mt. Hooker
Prince Albert
Battleford
Saskatoon
Winnipeg
Regina
Medicine Hat
Seattle
Portland
Spokane
Sitka
Juneau
Nome
Pt. Barrow
Kotzebue Sd.
Norton Sd.
Bristol Bay
Yukon R.
Mackenzie R.
C. Farewell
C. Chidley
RESOLUTION I.
SOUTHAMPTON I.
Churchill
York Factory
Fort Churchill
Ft. Resolution
Ft. McMurray
Dawson
White Horse
150° 160° 170° 180° 170° 160° 150° 140° 130° 120° 110° 100° 90° 80° 70° 60° 50° 40° 30° 20° 10°
A B C D E F G H I J K L M N O P Q R S T
1 2 3 4 5 6
80° 70° 60° 50° 40°



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voyages must have been undertaken, but all traces of them are lost. In 1524 Giovanni da Verrazano, sailing with a commission from the French king, followed the North American coast for a long distance, perhaps from Cape Fear as far as Cape Race. His narrative provides the earliest description of many of the characteristic features of the coast. At one point he saw open water beyond low-lying land, such as the narrow islands which protect the Albemarle and Pamlico sounds, and he guessed that this might be the much-sought Southern Sea. In consequence, many of the maps of the ensuing years represent a vast gulf of the Pacific, entering from the west and occupying the larger part of the northern continent, being separated by a narrow isthmus from the Atlantic. In 1534 and 1535 Jacques Cartier entered the Gulf of St. Lawrence and sailed up the river as far as the present site of Montreal, where he heard of the Great Lakes—another hopeful clue to the longed-for water passage to the east. During the second half of the century, attempts at settlement led to a more careful determination of the details of the north Atlantic coast. St. Augustine was founded in 1565. Raleigh's famous "lost colony" on the Carolina or "Virginia" coast was established in 1587, and the attempts to determine the fate of the settlers led to several voyages during the next two decades, by means of which the coast was more or less carefully examined from New Jersey southward. Farther north, the work of Gosnold in 1602, Pring in 1603, Champlain and Weymouth in 1605, and Hudson in 1609, marked out the courses which were followed year by year by a constantly increasing number of vessels.

Champlain settled Quebec in 1608, and began the systematic exploration of the interior by visiting the lake which preserves his name in 1609. In 1615 he penetrated to Lake Huron. Traders and missionaries year by year pushed their way farther up the river and along the lakes. Père Allouez, in 1665, founded a mission on the southern shores of Lake Superior, and in 1672, accompanied by P. Dablon, he made a tour through Wisconsin and Illinois. A year later Marquette and Joliet reached the Upper Mississippi. In 1679 La Salle began his career by a voyage from Niagara to the southern end of Lake Michigan. Hennepin, one of La Salle's companions, crossed to the Mississippi, which he followed up as far as Minneapolis in 1680. Two years later La Salle made a trip down the Ohio to the Mississippi, and on to the Gulf of Mexico, establishing the claim of France to the whole of the interior of the continent.

Henry Hudson, in 1610, entered the bay to which his name has been attached, and there he was left in an open boat by his mutinous sailors. Some years earlier, in 1592, Juan de la Fuca, in a Spanish vessel, probably entered the sound on the western coast which was more carefully explored and named by Captain Vancouver exactly two hundred years later, and carried home a report that he had seen a vast stretch of open water extending eastward. The attempts to find a way between these two bays, the search for the northwest passage, belongs to the article on Arctic discovery. The discovery of the interior of Canada was largely accomplished by the trappers and agents of the Hudson's Bay Company, which was organized in 1670; but it was not until 1740 that Varenne de la Verendrye made known the vast extent of the country lying east of the northern Rocky Mountains. In 1769-72 the fur trader Hearne traced the Coppermine River to the sea, and in 1793 Mr. (afterward Sir A.) Mackenzie, while crossing the continent for the first time north of Mexico, from the Atlantic to the Pacific, discovered the course of the river to which his name has been given.

The exploration of the western part of the United States did not begin until after the republic had acquired that region. As soon as the Louisiana purchase had been concluded, Jefferson dispatched Lewis and Clark to investigate the course of the Missouri and determine its relation to the Pacific, which they did by descending the Columbia to the sea, their journey occupying the years 1804-06. Pike, meanwhile, was traversing the country between the head waters of the Mississippi and Red rivers, and afterward, 1806, he followed the mountain ranges south, discovering the peak known by his name, and making important contributions to an understanding of the geography of the southwest.

Among the other explorers of the United States in the first half of the nineteenth century were Long, Bonneville, Schoolcraft, Catlin, Nicollet, and Frémont. Among their successors in the second half of the century were Wheeler, Whitney, Hayden, and Powell. The list of explorers of British America and Alaska in the nineteenth century embraces Sir John Franklin, Back, Richardson, Beechy, Dease, Simpson, and Rae, whose activity lay in the realm of Arctic exploration, and Bell, Selwyn, Dawson, Dall, Muir, Allen, Schwatka, Ogilvie, Russell, and Low. Of the many explorers of South America in modern times mention may be made of Humboldt, Maximilian of Wied, Spix, Martius, Auguste de Sainte-Hilaire, Orbigny, Pöppig, the brothers Schomburgk, Darwin, Avé-Lallemant, Tschudi, Castelnau, Burmeister, Herndon and Gibbon, Chandless, Crevaux, Bates, Karl von den Steinen, and Ehrenreich. Among the explorers of the Andes in recent times have been Reiss, Stübel, Whymper, Fitzgerald, and Conway.

COLONIZATION. Before Columbus left the newly discovered West India Islands in January, 1493, he built a fort on Española, now Haiti. Here some forty of his sailors remained to form a settlement which should serve as headquarters for the further discoveries that Columbus expected to make as soon as he could return to the new world. These first Spanish colonists were killed by the Indians, but their places were taken by others, numbering between two and three hundred, who accompanied Columbus on his second voyage. During the early months of 1494 the town which they built, named in honor of the queen, Isabella, rapidly assumed the appearance of a flourishing city. During the next ten years a constant stream of settlers, many of them accompanied by their families, flowed from Spain into the new city. Many of these remained there to practice the trades necessary to town life, while others took farms near by or went on to assist in building up the newer towns which were being established at every good harbor and in the mining districts. These places became in a surprisingly short time practically self-supporting, and they were soon able to supply men and equipment for further exploration. Cortes drew from Cuba whatever he needed for his enterprise of 1519, a debt which Mexico repaid by furnishing the supplies for the large expedition which Vasquez Coronado led through the present Arizona and New Mexico to the great buffalo plains of the Mississippi Valley in 1540-41. Moreover, Almagro and Pizarro drew from Panama the means for their adventurous expeditions into Peru and Ecuador, and these countries furnished the supplies to send Valdivia southward into Chile (1540), and Orellana and Ursua (see the article AGUIRRE) to explore the trans-Andean regions. By 1550 the Spanish-American settlements were firmly established, with every prospect of developing into powerful and wealthy colonies. Unluckily, the home Government in Spain persisted in retaining all the administrative authority in the hands of officials appointed in Europe. As a result, the colonists were subjected to a succession of incompetent, corrupt governors, ignorant of American conditions, and desirous only of securing the greatest annual revenue for themselves and for the royal treasury. Deprived of all the incentives of public service, the Spanish-Americans suffered a steady decline in social and intellectual tone, very similar to that which was so noticeable in the northern English colonies between 1690 and 1750. Missionary zeal supplied almost the only active force for extending the colonial limits. The Jesuits built up a very remarkable domination over the natives along the upper Paraná and Paraguay. and north of Mexico the Franciscans, although driven out of New Mexico by the native "rebellion" of 1610, eventually succeeded in laying the foundations for permanent settlements in that region. During the eighteenth century there was a flourishing provincial life along the upper Rio Grande del Norte, the strength of which may be inferred from the fact that the first printing press west of the Mississippi, in what is now United States territory, was set up about 1737 in the town of San Fernando de Taos, New Mexico, which is still many miles from any railway. The Franciscans, Dominicans, and Jesuits sent their friars into Upper California, and the mission buildings whose ruins are now so carefully cherished were begun during the second half of the eighteenth century. Soldiers and ranchers followed the priests, and by 1800 the Spanish settlements were scattered thickly along the Pacific coast and throughout the southwest.

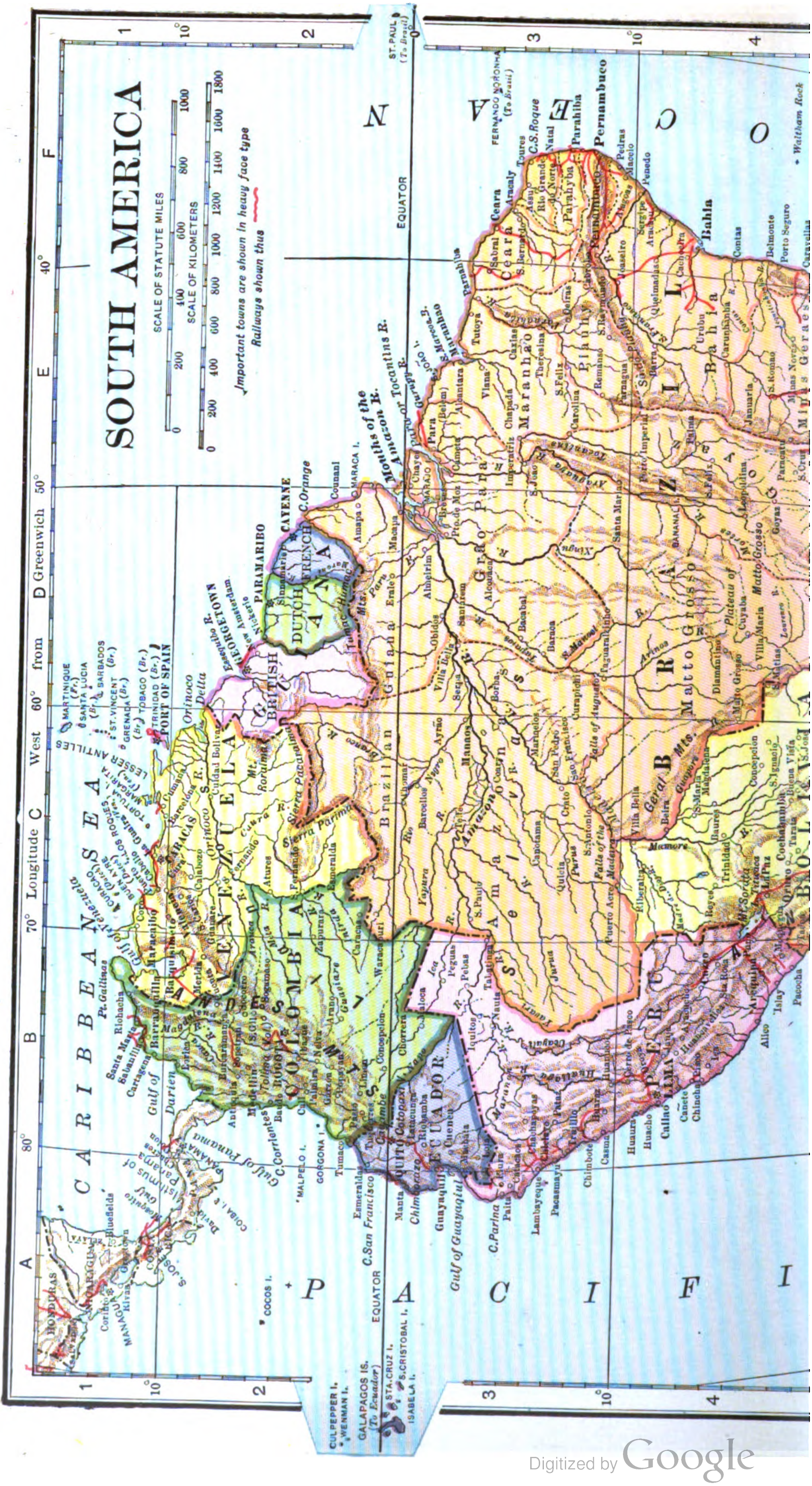
Portugal began to colonize the eastern coast of South America in 1531, in order to maintain its claim to what is now Brazil against the Spanish, who were locating everywhere else on the new continent. A few settlements along the coast, however, were all that resulted until early in the eighteenth century, when the Portuguese tried to develop the country as a substitute for the East Indian possessions which the English and Dutch had taken from them. There was little European impress upon the country, however, before 1808, when the Portuguese court emigrated to Rio de Janeiro, which became for a while a pseudo-European capital. In 1821 King John VI. went back to Portugal, but he left his eldest son, Dom Pedro, as emperor. Extensive Brazilian estates were granted to his European retainers, and foreign capital began to be introduced. The country was developed for investment rather than colonization. There was no extensive taking up of the land by Europeans until the second half of the nineteenth century, when Italians, Germans, and Poles turned their attention to this region of South America.

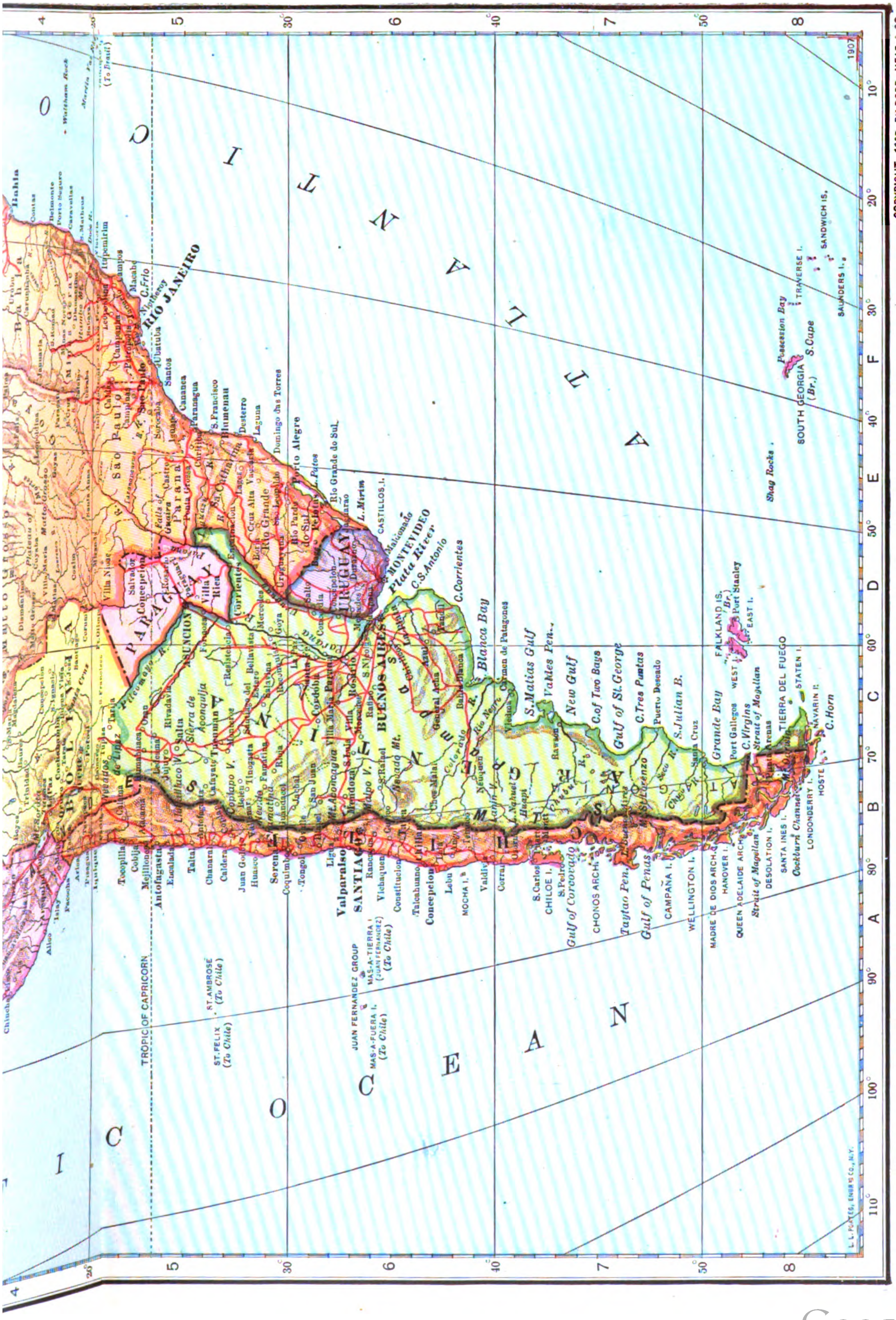
The French colonization of North America began with De Monts' settlement on the Bay of Fundy in 1604. The English (see the article ARGALL) effectually stopped all efforts to extend these settlements along the Maine coast, and so Champlain undertook to open up the interior by way of the St. Lawrence River. Quebec was settled in 1608, and Montreal in 1642; but these towns grew rapidly as trading and shipping places rather than as centres for colonization. A few other towns were started along the lines of communication with the trapping and hunting regions around the great lakes, as headquarters for trade with the Indians. As the competition with England for the possession of the country south of the lakes became keen, military posts, of which Fort Duquesne is the best known, were established on the Ohio and the Mississippi, to emphasize and protect the French claims. Nowhere was there much actual possession of the soil. When, in 1763, England secured the whole of French North America east of the Mississippi, the greatest part of it was open for settlement by her own people.

The English, like the other European nations, began by establishing outposts, first for the fishermen on Newfoundland before 1570, and in 1585 on the Carolina coast for the purpose of extending the search for gold and treasures inland. Religious and political conditions, however, changed the character of the English emigration to America soon after 1600. In 1620 and 1630 the Pilgrims and Puritans established themselves along Massachusetts Bay, with the deliberate purpose of becoming permanent inhabitants of the country. A few years earlier, in 1607, a Church of England colony had been attempted at Sagadahoc, now Popham Beach, on the Maine coast; but it made no permanent impression on New England. The same year a settlement was started at Jamestown, in Virginia, a successor to Raleigh's "lost colony" of 1587; and after many vicissitudes this gradually acquired a permanent character. The English Roman Catholics had held themselves ready to emigrate if necessary throughout the reign of Elizabeth; but it was not until 1634 that they prepared a place for themselves in Lord Baltimore's grant of Maryland. The development of New England, beginning with the "great immigration" of 1630, was very rapid. In 1635 the "Bay Colony" was able to spare a large body of people, who, disagreeing with the majority in some minor matters of doctrine, preferred to live by themselves along the Connecticut River. A year later, others who differed from the Boston elders in opinions regarding more vital points of dogma formed the Providence Plantations as a refuge for those who desired religious liberty. The Southern colonies were settled more slowly, the formal organization of colonial governments (the Carolinas in 1663 and Georgia in 1733) being brought about partly by the necessity of counteracting the extension of the Spanish settlements north and west from St. Augustine (founded in 1565).

The Dutch promptly organized trading posts along the river explored by Hudson in 1609, and sent over a large body of colonists during the next ten years to hold the country. Rivalry with the English on the east, and with the Swedes, who settled on the Delaware in 1638, prepared the way for the absorption of the latter by the Dutch in 1655, and in turn for the occupation of the Dutch territory by the English in 1664.

French trappers and frontiersmen wandered up


SOUTH AMERICA
SCALE OF STATUTE MILES
0 200 400 600 800 1000
SCALE OF KILOMETERS
0 200 400 600 800 1000 1200 1400 1600 1800
Important towns are shown in heavy face type
Railways shown thus
Longitude West from D Greenwich
70° 60° 50° 40°
A B C D E F
1 2 3 4
10° 0° 10°
EQUATOR
C A R I B B E A N S E A
LESSER ANTILLES
MARTINIQUE (Fr.)
SANTA LUCIA (Br.)
BARBADOS (Br.)
ST. VINCENT (Br.)
GRENADA (Br.)
TOBAGO (Br.)
TRINIDAD (Br.)
PORT OF SPAIN
CURAÇAO
BUEN AYRE
LOS ROQUES
TORTUGA
MARGARITA
Gulf of Venezuela
Gulf of Darien
Isthmus of Panama
Gulf of Panama
PANAMA
COLON
C. Corrientes
MALPELO I.
GORGONA I.
COCOS I.
COIBA I.
HONDURAS
NICARAGUA
MANAGUA
COSTA RICA
S. JOSE
V E N E Z U E L A
CARACAS
Orinoco Delta
Orinoco R.
C O L O M B I A
BOGOTA
E C U A D O R
QUITO
Guayaquil
Gulf of Guayaquil
C. San Francisco
C. Parina
P E R U
LIMA
Callao
GEORGETOWN
BRITISH GUIANA
PARAMARIBO
DUTCH GUIANA
CAYENNE
FRENCH GUIANA
C. Orange
MARACA I.
Mouths of the Amazon R.
Tocantins R.
MARAJO
Para (Belem)
Amazon R.
Madeira R.
Purus R.
Japura R.
Negro R.
Branco R.
Xingu R.
Tapajos R.
Sierra Parima
Sierra Pacaraima
Mt. Roraima
Guiana
B R A Z I L
Manaos
Maranhão
Ceara
Piauhy
Pernambuco
Bahia
Matto Grosso
Goyaz
Minas Geraes
Plateau of Matto Grosso
Geral Mts.
Falls of the Madeira
FERNANDO NORONHA (To Brazil)
C. S. Roque
ST. PAUL (To Brazil)
GALAPAGOS IS. (To Ecuador)
CULPEPPER I.
WENMAN I.
STA. CRUZ I.
S. CRISTOBAL I.
ISABELA I.
Waltham Rock
B O L I V I A
LA PAZ
P A C I F I C
O C E A N
A T L A N T I C



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and down the Mississippi and along its western tributaries in steadily increasing numbers from the time of La Salle's voyage down the river in 1682. By 1803, the year of the Louisiana purchase, these men and their descendants were scattered widely over the western plains, drawing their supplies from the large village at St. Louis or the small town of New Orleans. Politics was largely responsible for the annexation, in 1845, of Texas, and the same force, acting in advance of economic or agricultural reasons, led to the organization of the emigrant aid societies in 1854 to hasten the settlement of Kansas and Nebraska. The discovery of gold in California in 1848, in Nevada a decade later, and in the Klondike in 1897, resulted in opening up those regions. For further information, see special articles under the political divisions of the continent.

I. Independent States of the American continent and islands:

	Sq. Miles.	Population.	
United States Proper	3,025,000	76,300,000	(1900)
Alaska	591,000	63,000	(1900)
Porto Rico	3,600	953,000	(1899)
Hawaii	6,400	153,000	(1900)
	3,626,000	77,469,000	
Mexico	767,000	13,607,000	(1900)
Guatemala	43,000	1,842,000	(1903)
Salvador	8,000	1,006,000	(1901)
Nicaragua	49,000	429,000	....
Honduras	44,000	543,000	(1901)
Costa Rica	18,000	331,000	(1904)
Cuba	45,000	1,572,000	(1899)
Haiti	11,000	1,425,000	(1904)
Santo Domingo	18,000	416,000	....
Panama	33,776	400,000	....
Colombia	438,000	4,501,000	....
Venezuela	363,000	2,590,000	....
Brazil	3,292,000	17,371,000	(1900)
Ecuador	120,000	1,272,000	....
Peru	683,000	4,559,000	(1896)
Bolivia	473,000	1,734,000	(1900)
Chile	292,000	3,206,000	(1903)
Argentina	1,138,000	3,955,000	(1900)
Uruguay	72,000	978,000	(1902)
Paraguay	97,000	635,000	(1900)
Total for Independent States	11,596,000	139,541,000	

II. European dependencies:

	Sq. Miles.	Population.	
British Possessions:			
Canada:			
Ontario	260,000	2,183,000	(1901)
Quebec	351,000	1,649,000	
Nova Scotia	21,000	459,000	
New Brunswick	27,000	381,000	
Manitoba	73,000	255,000	
British Columbia	372,000	178,000	
Prince Edward Island	2,000	103,000	
Saskatchewan	250,000	250,000	(estimated 1906)
Alberta	253,000	250,000	
Northwest Territories	1,922,000	60,000	
Yukon	207,076	27,000	(1901)
	3,745,000	5,718,000	
Newfoundland	42,000	220,000	
Labrador	120,000	4,000	
Bermudas	20	19,000	
British Honduras	7,500	39,000	
Bahamas	4,400	55,000	
Barbados	160	197,000	
Jamaica and Caicos Ids	4,600	795,000	
Windward Islands:			
Grenada	130	66,000	
St. Vincent	130	48,000	
St. Lucia	230	52,000	
Leeward Islands:			
Antigua (with Barbuda and Redonda)	170	35,000	
Virgin Islands	270	40,000	
Dominica	290	29,000	
St. Christopher	60	30,000	
Nevis	50	13,000	
Anguilla	35	4,000	
Montserrat	30	12,000	
Trinidad	1,750	281,000	
Tobago	100	28,000	
British Guiana	95,000	295,000	
Falkland Islands	7,500	2,000	
	3,311,325	7,479,000	
French Possessions:			
St. Pierre Miquelon	90	6,000	
Guadeloupe	600	157,000	
Martinique	380	207,000	
Guiana	30,500	32,000	
	31,570	402,000	
Danish Possessions:			
Greenland	500,000	10,000	
Santa Cruz	75	18,000	
St. Thomas	30	11,000	
St. John	20	900	
	500,125	39,900	
Dutch Possessions:			
Curaçao	200	51,000	
Guiana or Surinam	50,000	83,000	
	50,200	134,000	
Total Foreign Possessions.	3,893,220	8,018,900	
Total for American Continent and Islands	15,744,020	143,588,900	

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AMERICA. The American national hymn, by the Rev. Samuel F. Smith (1832). The melody, ascribed to Henry Carey (1742), is identical with that of the English national anthem, "God Save the King," and, popular in France from 1775, became national in Denmark, Germany, and Prussia.

AMERICA. The name of the schooner-yacht which in the international yacht race of 1851 won the cup since known as the "America's Cup." See Yacht.

AMERICA'S CUP. See Yachts.

AMER'ICAN ALL'SPICE. See Calycanthus.

AMERICAN AL'OE. See Agave.

AMERICAN AS'SOCIA'TIONS AND SOCI'ETIES. For descriptions of associations and societies whose official titles begin with the word American, see names of subjects in which such organizations are interested. Example: For the American Academy of Political and Social Science, see POLITICAL AND SOCIAL SCIENCE, AMERICAN ACADEMY OF.

AMERICAN BAP'TIST MIS'SIONA'RY UNION. See MISSIONS.

AMERICAN BLIGHT. A term used abroad for the injurious effects upon trees or plants of plant-lice of the cosmopolitan genus Schizoneura, especially *Schizoneura lanigera*. For a general description of the ravages of plant-lice and the best methods for their destruction, see APHID. Consult *Circular No. 20*, Div. Entom., U. S. Dept. Agriculture (Washington, 1898).

AMERICAN BOARD OF COMMIS'SIONERS FOR FOR'EIGN MIS'SIONS. See MISSIONS.

AMERICAN COUS'IN, OUR. One of the best known plays of the English dramatist, Tom Taylor (1858), very popular a generation ago. The unimportant character, Lord Dundreary, became in the clever creation of E. A. Sothern a great part. For Americans, however, the drama must always possess melancholy associations, for it was while enjoying its presentation that Lincoln was assassinated.

AMERICAN FLAG, THE. See FLAG.

AMERICAN IN'STITUTE OF THE CITY OF NEW YORK. An organization to promote, by means of exhibitions and fairs, the interests of agriculture, commerce, manufactures, and arts in the State and country. The institute was founded in 1828, and its fairs attracted wide attention from investors and capitalists. Among the inventions which received early recognition from the institute were the McCormick reaper, the sewing machine, Colt's fire-arms, the type revolving and double power printing press machines, the first anthracite coal burning stove, the Morse telegraph, the stocking loom, the telephone, and the Francis metallic lifeboat and life-saving appliances. The American Institute now embraces in its organization five sections: The Farmers' Club, the Electrical Section, the Horticultural Section, the Photographic Section, and the Polytechnic Section. It has a valuable scientific library of over 15,000 volumes.

AMERICAN IP'ECAC. See GILLENIA.

AMER'ICANISMS. Words and phrases peculiar to the United States. They are classified by one writer on this subject (Bartlett) as follows: (1) Archaisms, obsolete, or nearly so, in Great Britain. (2) English words used in a different sense. (3) Words used in the original sense in the United States, although not in Great Britain. (4) English provincialisms adopted into general use in America. (5) Newly-coined words owing their origin to productions or circumstances of the country. (6) Words derived from European languages, especially the French, Spanish, and Dutch. (7) Indian words. (8) Negroisms. (9) Peculiarities of pronunciation. Accepting for the present this arrangement, we may cite as examples of archaisms, *fall*, for autumn, *freshet*, to *lam*, in the sense of to beat, to *squelch*, and to *tarry*. These are only a few; for an American philologist has stated that of the words, phrases, and constructions found in the Bible and Book of Common Prayer, "about one-sixth, which are no longer used in England in ordinary prose-writing, would apparently be used without thought or hesitation by an American author." Among the many English words used in a different or perverted sense are *barn* for stable; *boards*, for deals; *buggy*, a four-wheeled vehicle—in England, two-wheeled; *calico*, printed cotton, in England means unprinted; *clever*, for good-natured — in England, generally, intelligent or skillful; *corn*, for maize, whereas in England it means wheat, in Scotland, oats, and in Ireland, barley; *cracker*, for biscuit; *depot*, for station; *dress*, for gown; *forehanded*, well-to-do—in England, means timely, early; *hack*, a hackney coach—in England, a hired horse; *homely*, plain-featured—in England, homelike or unadorned; to *jew*, to haggle—in England, to cheat; *likely*, for promising; *lumber*, for timber; to *mail*, for to post; *notify*, to give notice—in England, to make known; *pond*, a natural pool of water—in England, artificial; *reliable*, for trustworthy; *saloon*, for tap-room; *smart*, for talented; *smudge*, a smouldering fire used to drive away insects—in England, simply an overpowering smoke; *store*, for shop; *tavern*, for inn (a tavern in Great Britain provides no lodgings); *temper*, with us meaning passion, is in England control of passion; *ugly*, for ill-natured; *venison*, deer's flesh—in England, meat of any wild animal; *track*, for line; *vest*, for waistcoat. We use also, in large number, different words for the same thing, as *conductor*, for guard; *editorial*, for leader; *elevator*, for lift; *horse-car*, for tram, and *sleeper*, for tie.

Examples of words retaining here their old meaning are: *Fleshy*, in the sense of stout; *offal*, the parts of a butchered animal not worth salting; *sick*, in the sense of ill; and *wilt*, in the sense of wither. On the other hand, *to heft*, meaning with us, to weigh by lifting, keeps, in England, its original meaning, to lift. Many words called archaic or provincial by English writers are widely current among Americans in both speech and literature—among them adze, affectation, angry (wound), andiron, bay-window, bearer (at a funeral), to blaze (a tree), burly, cesspool, clodhopper, counterfeit money, cross-purposes, deft, din, hasp, loophole, ornate, ragamuffin, shingle, stand (speaker's), stock (cattle), thill, toady, tramp, truck, and underpinning. Among newly-coined words and expressions are these, showing plainly their origin on the frontier or in the forest: backwoods, cache, clearing, to draw a bead, to fight fire, a gone coon, hogwallow, logging camp, prairie schooner, raft (of dead trees), squatter, squaw-man, the timber, and trapper. Ranch life has given us such words as corral, cowboy, roundup, and stampede; the mining regions, bed-rock, diggings, to pan out, to prospect, and to stake a claim. From the farm and plantation we have obtained among others, bagasse, broom-corn, Hessian fly, Indian meal, and truck-patch: while trade has supplied us with bogus, drummer, posted up, and to settle (a bill). Many others might be added from the language of Wall Street. Our political terms and phrases include the following, most of which are the subject of special articles in this Encyclopædia: Agricultural wheel, barnburner, bloody shirt, boodle, buncombe, carpet-bagger, caucus, copperhead, to eat crow, dark horse, doughface, favorite sons, fence-riding, F. F. V.'s, filibuster, fire-eater, gerrymander, half breed, stalwart, hunker, jayhawker, Ku-Klux-Klan, loco-foco, log-rolling, Lynch law, Mugwump, omnibus bill, pipe-laying, plank, primary, reconstruction, salt river, shin-plaster, spellbinder, squatter sovereignty, Greenbacker, wire-puller, Yazoo fraud.

Words derived from foreign languages are numerous, and one philologist (W. W. Crane) asserts that, though few are intelligible to English people, they are more extensively used by Englishmen than is generally supposed, and "form the really distinctive features of what may be termed the American language." Thus, from the Spanish we have in corrupted or contracted form, creole (*criollo*), garrote (*garrota*), jerked beef (*charqui*), key, a small island (*cayo*), lasso (*lazo*), mustang (*mesteño*), pickaninny, contracted to *pickney* in S. C. (*pequeño niño*), Sambo (*Zambo*, a person of negro and Indian blood); stampede (*estampedo*); and such literally appropriated words as adobe, bonanza, cañon, and mesa. From the French have been obtained among many, bayou (*boyau*, a trench), cache or cash (*cacher*), chowder (*chaudièrc*), shivaree (*charivari*), metif, an Indian half-breed (*métif* or *métis*), and the identical butte, levee, portage, prairie, and voyageur. From the Dutch have come boss, an overseer or superior (*baas*); cold slaw, cabbage salad (*kool slaa*); cruller (*krullcr*, to twist); hook, a point of land (*hoek*, a corner); noodles, an imitation of macaroni (*noodlejes*); overslough, to supersede or defeat (*overslaan*, to skip or pretermit); stoop or stoup, the step or steps of a house (*stoep*). Kill, a small stream, retains both its old sound and spelling, and Santa Claus (*Klaas*) receives as much respect as before the slight change in his name. The Germans have contributed bummer (*bummler*, a braggart, a wanderer), pretzel, and dude.

From the Indian we have chinquapin, a kind of oak (Va. Algonquian *che-chicnamin*); hominy (Va. Algonquian, *custathominy*); moccasin (Mass. Algonquian, *mockisin*); opossum (*appassum*); pow-wow (*powan*, a prophet or conjurer); raccoon (Algonquian, *aroughcūn*); sachem (*sakemo*); skunk (Abnakis, *secancu*); succotash (Nanaheganset, *mesicmotash*); toboggan (*odabogan*); tomahawk (Algonquian, *tamahagan*, a war-club); wigwam (Natic, *weecwahm*). Among words introduced or invented by the Southern negroes are: brottus, a small gift (Ga.); buccra, a white man; corn (harvest) songs (Md.); cracklings or goody-bread, bread containing roasted pork-rinds; enty? is that so? (Sea Islands); goober, a peanut (W. African *guja*, or Guinea *gobbe-gobbe*, Va. and N. C.); lagniappe, a tradesman's gratuity (Sp. *ñapa*, La.); moonack, a mythical animal; pickaninny, and pinder, a peanut (Fla.): while the Chinese word kowtow or kotow, salutation by prostration, has (or had) a limited use in the sense of obsequious politeness.

In the matter of pronunciation, slight differences exist. The word *trait*, for instance, is pronounced *tray* by the English, the *i* in *sliver* is lengthened by them, and *schedule* is commonly pronounced *shedule*. We may mention here that *cheerful* retains in some parts of the South its old pronunciation, *cherful*. In the pronunciation of proper names, English and American usages frequently disagree. In England Ralph is pronounced Rafe; Brownell, Parnell, etc., are accented on the first syllable; the last syllable of Gladstone is sounded short. With English surnames and geographical names cultivated Americans should seek to follow English usage. In Christian names Englishmen generally use only the first, while Americans always give the full form. In England we read of Ralph Emerson, Edgar Poe, etc. What have been termed by Grant Allen "Americanisms in spelling," examples of which are *labor*, *offenses*, and *theater*, are undoubtedly the result of the extensive use of Webster's spelling-books and dictionary.

Americanisms are classified by Reeves as follows: (1) Eastern dialects; (2) Southern; (3) Western; (4) Pacific or mining; and he adds as a possible (5) English-Dutch (German) of Pennsylvania. This convenient arrangement enables us to separate such words and phrases as are limited to particular sections or localities (provincialisms) from those that may be called national. Beginning with New England, we have: to *admire*, for to like, e.g., "I should admire to go;" to *allot*, or 'lot, for intend; *barm*, for yeast; *be*, for am or are; *bettermost; blob*, a blossom; *blowth*, blossoming time; *bungtown copper*, a counterfeit; to *calculate*, for to infer or suppose; *empti'n's*, any dregs; to *fail up;* to *fay*, for to fit; *fore-chamber*, a front bedroom (Me.); *gawnicus*, a dolt; *grayslick*, a glassy stretch of water (Me.); *Hessian*, as a term of reproach; *like*, without a specified object, as, "How did you like?" (a place, person); *long-favored*, tall; *mush-muddle*, a potpie (Cape Cod); *pew-cart*, a box-like carriage (Nantucket); *pleasant*, for pleasing; *pokeloken*, a marsh (Me.); *priest*, for a minister of any denomination; *pung*, a kind of sleigh; *rifle*, a whetstone for scythes; *sconce*, for discretion; to *seep*, to pour through a sieve or hole; *slip*, for pew; *spero*, a commonplace entertainment, "small doings" (Vt.); *staddle*, a sapling; *suant* or *suent*, level, uniform; to *sugar off*, to boil maple syrup down until it grains; *tackling*, for harness; *timbers*, for skeleton of a whale; *torsh*, the youngest child (Cape Cod); to *train*, to move briskly (like the militia on "training day"), to frolic; *vestry*, the chapel or lecture-room of a non-liturgical church; *v'y'ge*, for voyage; *wopper* (or *whopper*) *jawed; wicket*, a hut or shelter of boughs (Me.); *winegar*, for vinegar (Essex Co., Mass.); *York shilling*, ninepence. In New York State, among localisms derived from the Dutch, are *bockey*, a gourd-dipper; *fyke*, a bow-net; *hoople*, a child's hoop; *pile*, an arrow, and *scup*, a swing, a name still used by children of foreign parentage on the "east side" of New York City. *Slip*, an opening between wharves, is apparently an indigenous English word; the provincial English *duff*, dough or paste, signifies, in the Adirondacks, fallen and matted hemlock needles; and *dimpy* (probably from the English *dimpsy*, a kind of preserve) is the name given in some places to a tea-party, or a small social gathering at which refreshments are served. New Jersey, settled, like New York, both by English and Dutch, preserves in remote localities some Old World words, or perversions of the same; for example, *blickie*, a tin pail; *to heir to*, to inherit; *jag*, a small load; *mux*, disorder, and *piece*, a cold meal hastily prepared, or one for farm hands. Examples of the provincialisms of Pennsylvania, which were introduced by the English, Scotch-Irish, and Germans, and in many instances have been carried beyond her borders by emigration, are: *after-night*, for after candle-light; *April*, for April (Cumberland Valley); *barrick*, a hill; *bealing*, suppurating; *brickle*, brittle; *dipsey*, the sinker of a fish-line; *dozy*, timber brittle from decay; *fouty*, trifling; to *get shut*, to get rid; *gums*, for overshoes (eastern Pa.); *horsebeast; to lift*, a collection in church, to take up; *once*, immediately; *outcry*, public auction; *riffles*, ripples; *scrapple*, an article of food; *slave*, a fierce dog, i.e., needing to be chained (western Pa.); to *smouch*, to kiss; *sots*, common yeast; *to top* (a candle), to snuff; *to threap*, to argue; *yammer*, a whine or whimper.

The South has retained fully as many old English words and pronunciations as New England, and has originated some of the most expressive terms used in ordinary conversation, a number of which, by migration, have been domesticated in the West and on the Pacific coast. Among them are *afeared*, afraid; *amber*, expectoration produced by chewing tobacco (Va., Carolina); *beast*, horse; *branch*, a stream of any size; *bucket*, pail; *brogan*, a kind of boat (Chesapeake Bay); *castaway*, overturned; *centrical*, central (Va.); to *chunk*, to throw a missile; *coppen*, cow-pens; *complected*, having a certain kind of complexion; *condeript*, thrown into fits (Ky.); *corn-dodger; cracker*, a poor white (Ga., Fla.); *dinghy*, a kind of row-boat (Fla.); *dismal*, a swampy tract of land (N. C.); *docious*, for docile; *donock*, or *donnock*, a stone (Southwest); *escalan*, a kind of coin (La.); *evening*, afternoon (also in Illinois); *feaze* or *feeze*, an excited state; *fice* or *phyce*, a small dog, cur; *French*, anything distasteful (Va., Md.); *grundpy*, groundpea (Tenn.): *gum* or *bee-gum*, a hive made from a hollow tree; *gumbo*, okra, or a dish made of it; *gumbo*, a patois; *hammock* or *hummock*, a peculiar kind of land, often hilly (Fla., Tex.); *hoe cake*, a corn cake once baked on a hoe; *holpen*, helped (biblical); *honey-fogling*, for cheating or coaxing; *hot*, hit; *howdy*, how do you do?; *human*, for person; *Jeames*, James (Ind., Va.); *kiver*, cover; *lane*, any inclosed road; *lightwood*, pine chips or knots; *marooning*, picnicking or traveling by carriage; *mammoxed*, seriously injured; *marvel*, for marble; *maverick*, an unbranded yearling (Texas and Southwest); *million*, melon; *needcessity*, necessity; *or'nary*, contemptible; *paint*, a spotted horse; *peart*, lively, brisk; *pine-tag*, pine needle; a *polt*, a blow; *pone*, bread of Indian meal; *powerful*, very; *quarters*, farm buildings or out-houses inhabited by negroes; *rance sniffle*, a malignant act (Ga.); *rantankerous*, quarrelsome (Ga.); to *reckon*, to suppose or conclude; *rock*, stone; *roustabout; savigerous* or *survigrous*, fierce, alert; *slash*, low ground or an opening in the woods; *right smart*, great or considerable; to *scringe*, to flinch (Tex.); *skygodlin*, obliquely (Tex.); *swash*, a narrow channel of water; *tackey*, neglected or dowdy; to *tarrify*, to coerce; to *tote*, to carry; *trash*, worthless or low-born persons, especially *poor white trash; to up*, used as a verb; *used*, used to; *you all*, of any number of persons; *you-uns*, for you.

The West, using the term in its old sense, which included the interior States as well as the Northwest and Southwest, in addition to words derived from the French and Spanish, some of which have already been cited, has brought into its vocabulary many peculiar words and expressions. Such are *after-clap*, a demand made after a bargain is closed; *Arkansas toothpick*, a kind of bowie-knife; *bad man*, a murderer; *bell mare*, the horse leading a drove of mules (Southwest); to *bear off*, to separate a stray "brand" by riding between it and the herd (Southwest); *bodewash* (*bois de vache*), dried cow-dung used as fuel (Southwest); *to build*, to make shoes (Ohio); *to buss*, to strike; *catawampous* or *catawamptious*, terribly or completely; *country*, for State or section; *cowbrute* (Mo.); *doggery*, a grogshop; *drink*, river; *galoot*, to *take a gird*, for to make an effort; to *hustle; keener*, a sharp man; *lave!* (*lève*), get up! or rise up! (Mississippi Valley); *locoed*, for frenzied, Sp. *loco* (Kansas and Southwest); *long sweetening*, molasses (Iowa, from New England); *main traveled road*, highway; *naked possessor*, one without title to his farm (Southwest); *oldermost*, oldest; *plumb sure; to pull foot*, to hasten; to *raise*, to obtain; *robbilæ*, pemmican boiled with flour and water (Northwest); to *slosh 'round*, to brag, also to frequent saloons (South and West); *sugar* or *sugar-tree*, maple; *sun-up*, sunrise; *swinger*, the middle horses in a team of six; *tenderfoot*, a new-comer; *to trash* (to cover) *a trail; every whipstick*, for continually, often; to *want down* or *up* (Ill.); *worm* (or snake) fence; *to zit*, to sound like a bullet striking the water. The Pacific slope is responsible for *adobe*, soil from which *adobe* bricks are made; to *bach*, to camp out without ladies (Cal.); *Bostons*, white men in general (Or. Indian); *coulee*, a rocky valley (Or.); *claim*, land to which one has a legal right; *claim-jumper*, one who forcibly takes another's claim; *to coyote*, to sink a small shaft (Cal.); *diggings*, a particular locality; *hardpan; heeled*, for armed; *pay-streak*, a profitable lode or vein; *rusher*, a person going to the mines; *tanglefoot*, bad liquor. Local usage differs greatly in connection with articles in common use. The Eastern *paper bag* is in the central West a *sack*; a *scuttle* or *pail* is a bucket. The British *perambulator* is in the East a baby carriage, and in the Central West a baby buggy or cab. A *comfortable* is a comfort. A distinction, furthermore, should be made between words that are used in large cities and those that are in the main confined to small communities. In the country, people *hire help* and *keep girls;* in the cities they have *servants* or *maids;* the city *nurse* is lengthened in the country to *nurse girl*. The original English *folks* is now a provincialism in this country. It should be noted that most of the New England words and forms used by Lowell in the *Biglow Papers* are provincialisms. Some Eastern provincialisms are in general use in the Central West.

Early writers on Americanisms were wont to stamp every odd or vulgar word and expression as American, with the lamentable result, as Richard Grant White complained, of creating a belief that there is a distinctive American language, "a barbarous, hybrid dialect, grafted upon English stock;" the truth being that most of the so-called Americanisms were brought to this country by its early settlers, English, Scotch-Irish, Dutch, Germans, etc., and that many of them are now used only by the unlettered. The language of the "stage Yankee," and that of the characters in dialect-stories, Northern and Southern, are with few exceptions English, provincial or obsolete in the mother country, and not "American" in the true sense of the word. In the county of Suffolk, according to Lounsbury, the following "Americanisms" were current as recently as 1823: *Apple-fritters, by gum, chaw, cute, darnation, gal, gawky, hoss, ninny-hammer, ride like blazes, sass* (sauce), *sappy*, and *tan-*

trum. White prepared a long list of words and phrases supposed to be indigenous, and proved their British origin by citing early dates at which they appear in literature, or the names of authors in whose works they occur. Selecting from this list, and indicating by the letter "a." words known to be ancient, by "m." such as are still used in provincial speech, and by "Bible," King James' version, we submit the following: To *admire*, in the sense of to wish eagerly (Chapman's *Homer*, 1655); to *advocate* (Milton); *apart*, aside (Bulwer); *baggage*, luggage (Fielding, T. Hughes); *blizzard* (m.); *blow*, boastful talk (a. m.); *to bolt*, to rush or escape (Dryden); *bosom*, applied to a man (Shakespeare); *bull-doze* (W. Scott); *bureau*, for chest of drawers (Fielding, Hare); *by the skin of one's teeth* (Bible); *catamount* (a.); *chaw* (1530, m.); *chore*, light work (Ben Jonson); *clean gone* (Bible); *clever*, good-natured (Elizabethan writers); *conclude*, resolve (Tyndale, Froude); *crevasse* (Chaucer); *deck of cards* (Shakespeare); *divine*, clergyman (W. Scott, G. Eliot); *elect*, for conclude or determine (Lord Thurlow, Ruskin); *to enjoy poor health* (m.); *fall*, for autumn (Cairne, 1552; Froude); *feel to*, as in the expression, "I feel to rejoice" (m.); to *fellowship* (Chaucer); *fix*, to put in place or order (Farquhar, Sterne); *fleshy*, stout (Chaucer, Prof. Owen); *folks*, people (Byron, Bulwer Lytton); *gent* (Pope); *a good time* (Swift); *grain*, any cereal (Wiclif); *guess*, think or suppose (Wiclif, Milton, A. Trollope); *gumption* (a. m.); *heft* (Sackville, T. Hughes); *help*, servant (T. Hughes); *human*, person (Chapman's *Homer*); *hung*, hanged (Shakespeare, C. Reade); *to hustle* (a.); *illy* (a. m.); *influential* (W. Thompson, c. 1760); *improvement*, of an occasion, etc. (Defoe, Gibbon); *institution* in the sense of an establishment or foundation (Beatty, 1784; Trollope); *interview*, to meet for conversation (Dekker); *to let on*, to divulge (m.); to *let slide* (Gower); *limb*, leg (Fielding); *love*, like (Cowper); *lucrative* (Bacon); *mad*, angry (Bible, Middleton); *magnetic* as an adjective (Donne); *to make a visit* (m.); *metropolis*, the chief city of the State (Milton, De Quincey, Macaulay); *million*, melon (Pepys); *musicianer* (Byron); *nice*, pleasing or agreeable (a. m.); *notify*, to give notice (m.); *notions*, for small wares (Young); *overly*, excessively (m.); *parlor*, for drawing-room (G. Eliot, Helps); *peruse*, scan or read (W. Scott); *professor* of religion (Milton); *pumpion* (pumpkin) pie (1655); *quit*, leave off (Ben Jonson); *railroad*, railway (J. H. Newman, Mrs. Trollope); *rare*, underdone (Dryden); *reliable* (Richard Montagu, 1624; Gladstône); *reckon*, suppose or conclude (Bible, W. Scott); *rock*, stone (a.); *run*, a small stream (a.); *sick*, ill (Bible, Evelyn); *skeddadle* (m.); *slick* (a.); *span new* (Chaucer); *spell*, a period of time (a.); *spruce*, for neat (Evelyn); *spunky* (Burns); *swop* (B. Jonson, Dryden); to *take on*, to wail or grieve (a.); *tend*, attend (Shakespeare); *town* as a geographical division (Wiclif); *well*, prefacing a sentence (Disraeli); *whittling* (Walpole); and the writer would add the following which are sometimes ridiculed as outlandish products of the New World: *A howling wilderness* (Bible): *Mr. ——— and lady* (Thackeray); and to *set store by*, in the sense of to prize or appreciate (Mrs. Oliphant). Gilbert M. Tucker says that the 460 words in Elwyn's *Glossary of Supposed Americanisms* are all of British origin; that in Pickering's work (1816) not more than 70 words out of the 500 are really American; and that out of the 5000 or more entries in Bartlett's *Dictionary*, only about 500 are genuine and distinct Americanisms now in decent use. Most New Englanders, said James Russell Lowell, speaking of colloquialisms still heard in Massachusetts, stand less in need of a glossary to Shakespeare than many a native of the old country. It may be added that many words formerly termed Americanisms are as commonly used in England as here, though not in polite speech or literature: e.g., *bamboozle*, *chockful*, *duds*, and *sight* for number, while, on the other hand, such old forms as *axe* for ask, and *housen* for houses, are frequently heard in England and rarely here.

Richard Grant White and T. R. Lounsbury limit the term "Americanisms" narrowly. According to the former, they must not have been transplanted, but must be perversions or modifications of English words or phrases, and must be used in the current speech or literature of the United States at the present day. "Words which are the names of things peculiar to this country are not Americanisms, except under certain conditions (*maize, squaw, wigwam*). They are merely names which are necessarily used by writers and speakers of all languages. If, however, any such word is adopted here as the name of a thing which already had an English name (*wigwam*, for hut; *squaw*, for wife), it then becomes properly an Americanism. *Indian*, and names compounded of *Indian*, were given by Europeans. Indian pudding is an American *thing*, but its name is not an Americanism." As he rejects *Indian summer*, *paleface*, *succotash*, *tomahawk*, and the rest, White asks, "What have we to do with the Indian?" and proceeding, crosses from the list of cherished "Americanisms," *bronco*, *lacrosse*, *stampede*, and their kin; *abolitionist*, *border-ruffian*, *gerrymander*, *reservation*, etc., as well as *groundhog*, *long-moss*, *pine barrens*, and *saltlick*, to go further, besides refusing to discuss such words as *intervale* and *water-gap*, because they are "legitimate English." Lounsbury, like White, objects to the expression, "the American language," and remarks of the so-called "Yankee dialect" that it is never "the characteristic tongue of any one man, or of any one class, or of any one district." He doubts whether the term "Americanisms" can be regularly applied to *cent*, *congress*, *mileage*, *nullification*, and so on, and prefers to call them "American contributions to the common language."

American newspapers are largely to blame for the mongrel and high-sounding words heard in the United States, especially those derived from the Latin or the Greek. The oratory of political campaigns gives rise to not a few astonishing Americanisms, and our humorists have coined many more that are beloved by the public. Persons of fair education, who, as we learn from their talk, *engage* in *avocations*, *reside* in a *mansion*, wear *pants*, *donate* to charities, ride to the *metropolis* in a *smoker*, *retire* to bed, and have *proclivities*, must be expected to use also *enthuse*, *funeralize*, *saleslady*, and *shootist*, when they find them in their favorite journals; but criticism under this head comes with little grace from the English, whose *leaderette* is as absurd as our *editorial paragraph*, and *agricultural laborer*, a clumsy name for him whom we term a *farmhand*. Our colleges, Yale in particular, are prolific in slang, some of which, as *to rattle*, in the sense of to confuse, soon become public property. Most of our colloquial expressions are short-lived, but the following may be instanced as having been in use for a long period: *to absquatulate; baggage-smasher; to bark up the wrong tree; bottom dollar; caboodle; to boost; to cavort; conniption fit;* not *to care a continental;* a *continental darn; to chip in; coon*, a colored man; a *coon's age*, an indefinitely long time; *to dust*, to leave quickly; *to euchre out; to flash in the pan; flatfooted; gum game; highfalutin; last o' pea time; level best; to liquor; to moosey*, to leave quickly; *obligated; to paddle one's own canoe; to pan out; picayune*, small, mean; *to raise Cain; right away; to run*, in the sense of to manage or conduct; *to salt* a mine; *sample room*, drinking-bar; *shoddy*, applied to a person; *to smile*, to drink spirits; *socdologer*, a finishing blow or argument; *to sour on; a square meal; to strike oil*, to get rich suddenly; *to stump*, to puzzle, or challenge; *to talk turkey*, to brag; *tuckered out; to vamose* (Sp. *vamos*), to leave quickly; *to weaken*, to yield or give out.

T. W. Higginson (see *Bibliography, infra*), in examining a glossary of the slang used about 1798 by British prisoners in the Castle in Boston Harbor, now Fort Independence, discovered a number of words that had been classed as of recent origin, the most familiar of which are *grub*, victuals; *douse the glim*, to put out the light; and *spotted*, for found out. Also some that are not given in any English glossaries, as *briar*, a saw; *nipping-jig*, the gallows; and *wibble*, a dollar. Most of these expressions belong to the *argot* of thieves.

When we remember that the dialects of the counties in England have marked differences—so marked indeed that it may be doubted whether a Lancashire miner and a Lincolnshire farmer could understand each other—we may as well be proud that our vast country has, strictly speaking, only one language. It is remarkable that the influx of European immigrants has not resulted in some States in reducing English to a *patois*, if not in extinguishing it, or in giving it scant room in a mongrel vocabulary. Again, it might reasonably be expected that, in the course of three centuries, the political and social changes which we have undergone, and the peculiar circumstances attending the settlement of new regions, would have separated us so widely from the mother country that, in spite of kinship and commercial and literary intercourse, some radical differences in language would have been evolved.

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AMER'ICAN KNIGHTS, ORDER OF. See KNIGHTS OF THE GOLDEN CIRCLE.

AMERICAN LIT'ERATURE. A term applied rather loosely to the body of writings in the English language produced in the territory now occupied by the United States. It includes a period extending from 1608, when Captain John Smith's *True Relation* was published in London, to the present day. Strictly speaking, the works of Smith and of those of his contemporaries who did not make a permanent sojourn in the New World, belong rather to British than to American literature. Again, it is plain that the term literature must be used with considerable latitude, if it can be made to include the news-letters, the bare annals, the topographical treatises, the controversial pamphlets, the sermons and other theological lucubrations that form the bulk of the writings produced by the colonists of the seventeenth and eighteenth centuries. The paucity of the materials at their command has, however, induced American literary historians to give a hospitable reception to almost everything that can be called a book written in the American colonies or about them, whether published in England or at home after Stephen Daye had set up his press at Cambridge, Mass., in 1639. We need not here imitate their grasping tendencies, yet we may find a few works of importance dating before 1700 that will demand our attention.

Surprise has sometimes been expressed at the fact that Englishmen, contemporaries of Shakespeare and Milton, should, in their new environment, have written practically nothing of æsthetic value. The excuse is usually made for them that they had many more necessary things to do, such as felling the forests and keeping off the Indians. This excuse is certainly applicable, but it may be doubted whether the Puritan or the Cavalier stock that settled America would have been noted for great contributions to English literature had they remained in the mother country. The companions of Bradford and Winthrop would have done what writing they did on theological lines; the companions of Captain Smith and the younger sons of royalist country gentlemen would have written little more than they did in Virginia. This is but to say that there is slight reason to express surprise that the colonial literature of the seventeenth century is chiefly valuable to the historian and the antiquarian. The early colonists wrote for utilitarian purposes. The

Virginians wrote to convey information to their friends at home and to encourage emigration; the Puritans wrote for these reasons and also to defend and expound their theology and to train up the new generations in the ways of the old. For literary art in itself, or indeed for any art, they had little care; but when, as not infrequently happened, the men who wrote were interesting or even great in their private or public capacities, they managed to impart some of their own finer qualities to their writings, which may not exactly live, but are, at least, worthy of remembrance if not of perusal by the reader interested in the history of his country.

The portion of this early literature produced by the Southern and Middle colonies is comparatively meagre. Captain Smith's works, which culminate in the composite *General History of Virginia, New England and the Summer Isles* (1624), are quaint and crude but full of their adventurous and magniloquent author's energy. William Strachey's account of the famous wreck of Sir Thomas Gates (1610) may possibly, some think probably, have given Shakespeare hints for his description of the storm in *The Tempest*. Nothing so interesting was in all probability produced in Virginia until 1649, when a certain Colonel Norwood narrated to his relative, Sir William Berkeley, the adventures that had befallen him during and after his shipwreck. The same picturesque Governor Berkeley is one of the protagonists in the next Virginian tract of importance—the so-called *Burwell Papers*, descriptive of Bacon's Rebellion (1676). Only two interesting books are credited to Maryland during this century, John Hammond's *Leah and Rachel* (1656) and George Alsop's quaint *Character of the Province of Maryland* (1666). The Carolinas were settled too late to produce anything of consequence. The same thing is true of the middle colonies, although Daniel Denton's *Brief Description of New York* (1670) is not uninteresting, and Gabriel Thomas's *Account of Pennsylvania and New Jersey* (1698) does not lack sprightliness.

An abundance rather than a lack of writings confronts the student of the Seventeenth Century New England, but few books and writers need mention here. The histories composed by Governor William Bradford of Plymouth and Governor John Winthrop of Massachusetts have many merits, but are on the whole fatiguing reading. The sermons and theological treatises of such representative divines as Thomas Hooker, Thomas Shepard, John Cotton, Peter Bulkeley, and their compeers furnish interesting passages for our anthologies, but are rarely read *in extenso*. The works of Roger Williams are probably treated in a similar fashion; but the loss falls upon the reader as well as upon the fame of that truly great man. Another writer who deserves more attention than he receives is Daniel Gookin, who wrote two books about the Christian Indians, for whom he labored in conjunction with that famous apostle, John Eliot. But unquestionably the most interesting book in prose produced in New England during the seventeenth century was Nathaniel Ward's *Simple Cobbler of Agawam* (1647)—a whimsical compound of satire and invective that is almost without parallel. John Josselyn's *New England's Rarities Discovered* (1672) and his *Account of Two Voyages* (1674) deserve mention also as almost turning credulity into artistic virtue.

But the early New Englanders wrote verse as well as prose—especially verse of an elegiac nature. In 1640 appeared the astonishingly crude *Bay Psalm Book*. Ten years later Mrs. Anne Bradstreet's *Tenth Muse Lately Sprung up in America* was published in London, accompanied by poetical panegyrics that made the modest woman blush. Mrs. Bradstreet was not without genuine powers, as her later works showed; but she followed bad models, had no eye for the beauties of nature, and is in consequence almost unreadable to-day. This fate has not befallen Michael Wigglesworth's *Day of Doom* (1662)—a New England Inferno which long continued to be popular. Its quaint stanzas are perused to-day with sensations quite different from those produced by them two hundred years ago; but they are still read, and even quoted for amusement, a fortune not accorded to the amiable Wigglesworth's other performances. Wigglesworth is, however, almost a great poet when he is compared with contemporaries like Peter Folger, Franklin's grandfather, whose *Looking-Glass for the Times* (1677) is almost the *ne plus ultra* of doggerel. Perhaps the only poems of any decided merit composed in America during the seventeenth century are an anonymous epitaph on Bacon, given in the *Burwell Papers*, and an *Elegy on the Rev. Thomas Shepard* (1677), by the Rev. Uriah Oakes, President of Harvard.

The close of the seventeenth century in New England is marked for us by the famous persecutions for witchcraft which have given so sinister a reputation to many good men, especially to the two Mathers, Increase and Cotton. These are in some ways the most important divines of early New England, although they mark the decline of the theocracy rather than its culmination. Both were voluminous writers, and both treated in particular the two topics uppermost in the New England mind: to wit, the struggles of the saints against witches and fiends and against the savage Indians. All the dominant ideas of the times are found embodied in the younger Mather's encyclopædic *Magnalia Christi Americana* (1702), a chronicle which is not altogether authoritative as to facts, but is typical of its fantastic author and of the Brahmin caste he represented. Typical of the old order that was passing, and of the new that was coming in, is Judge Samuel Sewall's *Diary*, which ran from 1673 to 1729. Sewall is the Pepys of his time, and many a quaint page can be extracted from his jottings; but he should also be remembered as perhaps our first abolitionist, his short tract, *The Selling of Joseph*, dating from 1700. Another early diarist is Mrs. Sarah Kemble Knight, who wrote a sprightly account of a journey she took on horseback in 1704 from Boston to New York. Even in New England, secular writing became more popular as the eighteenth century advanced, which is what one might expect, since the colonies were growing prosperous and were being affected by the utilitarian tendencies of the epoch. There is a considerable amount of verse, none of it of much consequence, and there is quite a mass of history, particularly of narratives dealing with Indian atrocities. Probably the most important poets are the Rev. Mather Byles and his contemporary, Joseph Green, but they succeeded best in trifles. The most scientific historian of the period is the Rev. Thomas Prince; the most interesting is the quaint Scotchman, William Douglass, whose *Summary* dates from 1747-51.

But theology did not vanish from New England with the weakening of the theocracy. The Rev. John Wise, with his *Churches' Quarrel Espoused* (1710) and his *Vindication of the Government of New England Churches* (1717) showed himself to be the peer of any of his forerunners, and gave lessons in statesmanship to the Revolutionary leaders who were to follow him. Greater than Wise was Jonathan Edwards, the most original theologian and metaphysician that the New World has produced. In his juvenile papers Edwards anticipated Berkeley; in his personal memoranda and occasionally in his formal treatises, he showed that he was a poet-mystic and a lover of nature rare for his times; in his *Narrative of Surprising Conversions* (1736), he displayed a remarkable psychological acumen. He is, of course, best known to-day by his *Freedom of the Will* (1754), which is still a powerful piece of exposition, although its conclusions seem monstrous and untenable, and by his minatory sermons, which, like the famous one preached at Enfield, Conn., held his awestruck hearers suspended over the very mouth of hell. Edwards's theology is now antiquated, but his works contain the germs of nearly all subsequent theological speculations, and they are a well of inspiration to thoughtful readers.

The only American colonial who ranks with Edwards as a writer and thinker, Benjamin Franklin, while also a New Englander, is always regarded as a representative of the middle colonies. Other interesting writers were grouped about him in Philadelphia, but New York and New Jersey produced few of any consequence. As a student of nature Franklin was only the foremost of an interesting group of men such as James Logan, John Bertram, and John Winthrop, of Harvard. As a writer and thinker on political subjects he exemplified the spirit of the age that was to produce publicists like John Dickinson, whose *Letters from a Farmer* (1767) focused the spirit of resistance; Samuel and John Adams, Jefferson, Hamilton, and Madison—men whose political writings, culminating in *The Federalist* (1788), astonished Europe and reached what perhaps is the high-water mark in this species of composition. For, as is well known, the eighteenth century was not less predominatingly political than the seventeenth had been theological. It was also utilitarian, and so Franklin, who thoroughly summed up his age, was the creator of Poor Richard, whose *Almanac* may almost be said to be the foundation stone of popular education in America. It is probably his delightful *Autobiography*, however, that gives Franklin his position as the writer of the only literary classic produced in America before the nineteenth century. Taken along with his letters, this book, in both style and substance, furnishes us with one of the most remarkable self-revelations in literature. We read from a sense of duty a few authors of our Revolutionary period, like the satirists Francis Hopkinson and John Trumbull, author of *McFingal* (1775-82); we know *The Indian Burying Ground*, and a few other verses of the patriotic poet, Philip Freneau; we remember from our histories that the ill-fated Thomas Godfrey was the author of our first real poetical tragedy, *The Prince of Parthia* (1765); we smile at the mention of Joel Barlow's *Vision of Columbus* (1787), which developed into his formidable epic, *The Columbiad* (1807); but for many of us the true American literature of the eighteenth century is represented by the miscellaneous writings of Franklin.

This, however, is not altogether fair. Several of Franklin's contemporaries deserve to be remembered as writers of interest and of some importance. Among these are the Quaker John Woolman, the loyalist historian of Massachusetts; Thomas Hutchinson, the patriotic historian and portentous dramatist and poet; Mrs. Mercy Otis Warren; the negro poetess, Phillis Wheatley, whose imitative verses astonished the learned of her day; the laborious poet, Rev. Timothy Dwight, whose *Conquest of Canaan* (1785), together with the productions of the so-called "Hartford Wits," was intended to lay the foundation of a real American literature, and has at least been buried sufficiently deep for that purpose; the novelist, Mrs. Susanna Haswell Rowson, whose *Charlotte Temple* (1790) is still read—all these and a few other writers should be remembered before we accuse the eighteenth century in America of literary barrenness. These are not a tithe of the authors whom a serious literary historian would feel obliged to treat, and even we must add to them such a conscientious, if dull, historian as the Rev. William Stith, of Virginia, the distinctly more picturesque defender of the Old Dominion, Robert Beverley, and the genial cavalier, Colonel William Byrd, of Westover, whose *History of the Dividing Line* (1729) between Virginia and North Carolina is a remarkably entertaining production. To these Southern historians the name of Dr. David Ramsay, of South Carolina, should be added; but it is of more importance not to forget the greater works of two citizens by adoption—the Englishman, Thomas Paine, and the Frenchman, Hector St. Jean de Crèvecœur. Paine's *Crisis* and his *Common Sense* (1776) did perhaps more to make independence the goal of the American Revolutionists than any other contemporary writings, and it was the spirit of the Revolution that animated his later but less acceptable books. Crèvecœur's *Letters from an American Farmer* (1782) are full of an idealism more charming than can be found in Paine and of a love of nature almost worthy of Thoreau himself.

The confused period between the close of the Revolution and the beginning of the nineteenth century was naturally not propitious to literature. But many of the writers mentioned in the last paragraph did their best work in it, and to them we may add the names of Royall Tyler, whose play, entitled *The Contrast* (1786), was the first American comedy of importance; Noah Webster and Lindley Murray, famous later for their works in lexicography and grammar; Jeremy Belknap, author of one of the best of our early State histories, that of New Hampshire (1784); William Dunlap, whose *History of the American Stage* (1832) is still important, and Joseph Dennie, a writer of a mildly Addisonian type, whose *Portfolio*, founded in 1801, marked, with the contemporaneous establishment of the New York *Evening Post*, the great aid that journalism would give to literature throughout the new century.

But a more conspicuous writer than any of these, our first novelist, Charles Brockden Brown, had written his three most important novels, *Wieland*, *Ormond*, and *Arthur Mervyn* in the three closing years of the eighteenth century. He published three other novels in 1801, and his literary activity, which was mainly associated with Philadelphia, promised much for the new Republic. But his work was cut short by ill-health and an early death, and to modern readers his stories, while marked by distinct imaginative power, are too plainly connected with the extravagant school of Godwin and Mrs. Radcliffe to be attractive. Brown deserves, however, to be remembered as the first American who made the profession of letters a success, and he was a genuine predecessor of Hawthorne and Poe.

The opening decade of the nineteenth century was one of great political importance; but it is marked by few literary names of note, John Marshall's *Life of Washington* (1804) being less important than his judicial decisions, and the writings of the Rev. M. L. Weems and William Wirt not meaning much to the sophisticated readers of a century since. But in 1809 a work that will probably never lose its interest made it certain that American literature, in the true sense of the term, had been born. In this year Washington Irving gave the world "Diedrich Knickerbocker's" *History of New York*. Irving may be a little out of fashion to-day with some readers, and he may seem almost as much a British as an American classic; but a classic he is, whose style has perhaps not been surpassed, and whose essays, short stories and works of travel, biography and history must be read by all cultivated Americans. During his long life he was the worthy head of the Knickerbocker school of writers who made New York the literary centre of the country before the rise of New England Transcendentalism.

It was more than a decade, however, after Irving's success before a really great writer arose to keep him company. Such poets as Washington Allston, John Pierpont and Mrs. Sigourney, and such a dramatist as John Howard Payne, cannot send us back, with any great enthusiasm, to the second decade of the century just passed. It is true, nevertheless, that the founding of the *North American Review* at Boston in May, 1815, was an important event, and that by publishing two years later the youthful Bryant's *Thanatopsis*, it introduced to the world a poet of dignity and power, who, if not precisely great, was at least able to interpret pleasingly and satisfactorily to Americans the natural beauties of their native land. Two other poets, inferior to Bryant, yet still remembered, Joseph Rodman Drake, author of *The Culprit Fay*, and Fitz-Greene Halleck, author of an elegy on Drake and some stirring lyrics, also made their first appearance in this decade.

When James Fenimore Cooper published *Precaution*, in 1820, he gave the public no evidence that one of the greatest of modern writers of fiction had arisen. A competent reader of *The Spy*, which was issued the very next year, might, however, have perceived the fact. Two years later, *The Pilot* and *The Pioneers* showed that although Cooper might be essentially a follower of Scott, and although his style might be often slipshod and his power of characterization, especially in the case of women, almost *nil*, he was, nevertheless, master in his own splendid domain, the sea, the forest, and the prairie. The *Leatherstocking Tales* have been frequently called the real American epic, and a recognition of the truth of this statement would prevent many persons from underrating the genius of one of the few Americans who have won a world-wide fame by their writings. America has produced several authors of finer genius than Cooper possessed, but perhaps none of larger.

Besides Cooper, the third decade of the last century brought into notice the poet James Gates Percival, who unfortunately did not deserve the reputation he speedily acquired. A less highly praised poet, Edward Coate Pinkney, is now more interesting on account of his small but genuine lyric vein. The same decade counts among its worthies the indefatigable historiographer, Jared Sparks, and the admirable student of Spanish literature, George Ticknor. Lydia Maria Child, Edward Everett, the elder William Ellery Channing, and Bronson Alcott also made their appearance as writers; and Poe and Hawthorne published juvenile works that are now very rare. But perhaps the best-known production of the period is Webster's reply to Hayne, which struck the keynote that was to dominate our literature for the next generation.

The year 1831 saw the establishment of William Lloyd Garrison's *Liberator* and the publication of Whittier's first book, *Legends of New England*. Both men were to do a great work for the anti-slavery cause, and Whittier in especial was to endear himself to his native section as its true poet laureate. The writer who best represented New York at this period was Nathaniel Parker Willis, poet, traveler, and journalist. But he, though still interesting, has greatly declined in reputation. The same thing is true of those representative ante-bellum Southern writers, William Gilmore Simms, of South Carolina, and John Pendleton Kennedy, of Maryland, who, with Robert Montgomery Bird, of Pennsylvania, formed a group of romancers inferior indeed to Cooper, yet worthy of being read, at least in their best novels, such as *The Yemassee*, *Horse-Shoe Robinson*, and *Nick of the Woods*. Besides these writers, who began their careers in the thirties, we should recall the historian George Bancroft, whose *History of the United States* remains eminently valuable.

The Transcendental movement in New England, culminating in *The Dial* of the early forties, is, of course, the prime fact of American literary history before the Civil War. Yet many of the writers more or less connected with it, such as the critics George Ripley and Margaret Fuller, and the poets C. P. Cranch and Jones Very, have long since become mere names to most readers. The poet-naturalist, Thoreau, however, has not only held his own, but gained ground year by year, and Emerson has taken his place with Hawthorne and Poe in the very front rank of American writers. Throughout his long life, Emerson was to his countrymen and to many Europeans not merely a great writer but an inspiring seer, and there are not wanting readers to-day who consider him, in his double capacity of philosopher and poet, the greatest of American men of letters. Since the publication of his *Scarlet Letter* (1850), this position has been assigned to Hawthorne by the majority of his fellow citizens, while foreign readers have unhesitatingly assigned it to Edgar Allan Poe, whose haunting poems and tales have seemingly exerted a greater literary influence than the works of any other American.

More influential, so far as the culture of the American people is concerned, has been the poetry of Henry Wadsworth Longfellow. It has been recognized by the critics that Longfellow's genius was at first overestimated; but critical depreciation has probably been carried too far, and it seems quite likely that the best loved of American poets will continue to rank not far below the greatest of his contemporaries. Much the same thing may be said of Oliver Wendell Holmes, whose *Autocrat of the Breakfast Table* (1858) has lost little or nothing of its popularity. As a poet also, Holmes, though he may most fairly be called the laureate of Boston, still has a hold upon the heart of the nation, and he should perhaps be better known as a novelist than he is; for his *Elsie Venner* (1861) is a striking book.

James Russell Lowell, by his *Fable for Critics* and the first series of *The Biglow Papers* (1848), had proved himself to be our greatest poetical humorist and satirist before the Civil War began. That cataclysm inspired him to write his great odes, and later he became easily the first of American critics and letter-writers, and one of the first of American publicists. He is too near us for a proper estimate to be made of his rank in our literature, but it would appear that his fame as humorist, essayist, and epistolary master is secure. Secure, too, seems the fame of those admirable historians William H. Prescott and John Lothrop Motley, although the former's works have suffered through the discoveries of modern investigators. Their junior, Francis Parkman, is, however, generally regarded as their superior, his great series of histories dealing with the struggle between French and English for the mastery of the New World being as fascinating and at the same time as scientifically thorough as any other modern historical compositions.

All the writers treated in the immediately foregoing paragraphs won at least a partial recognition before the Civil War. Their fame has not, however, entirely cast in the shade such writers as Richard Henry Dana, Jr., author of *Two Years Before the Mast* (1840), and Herman Melville, whose *Typee* (1846), *Omoo* (1847), and *Moby Dick* (1851), are among the best books of adventure in our literature. Nor is the work of Bayard Taylor, Donald G. Mitchell, Richard Grant White, James T. Fields, Thomas Wentworth Higginson, and Charles Eliot Norton, to be omitted even in so brief a sketch as the present. Mention should be made also of George William Curtis, E. P. Whipple, and the two Southern poets, Paul H. Hayne and Henry Timrod, as well as of the worthy Philadelphia dramatist and poet, George Henry Boker. Two other writers who emerged before the Civil War have attained positions only just below the highest. One, Mrs. Harriet Beecher Stowe, stirred the sympathies of the civilized world by her pathetic story of American slavery, *Uncle Tom's Cabin* (1852); the other, Walt Whitman, by his *Leaves of Grass* (1855-83) poetically expressed the democratic ideal in a way that appealed profoundly to European readers, and has won him quite a large circle of devotees at home.

The most noteworthy name in the decade to which the Civil War belongs is that of Samuel L. Clemens, who, over the pseudonym of "Mark Twain," won a world-wide reputation as a humorist and writer of fiction. With him appeared a number of authors whose later and more mature work has made them known throughout the country. One of the most important books of the decade was *The Man Without a Country* (1863), by Edward Everett Hale. Appearing at a time when the feelings of the nation were so divided, it did much to strengthen a spirit of loyalty to the Union. Two other writers, who first came to notice in the sixties, were cut off in what promised to be most fruitful careers—Theodore Winthrop, the novelist, whose *John Brent* (1862) was full of racy vigor, and Sidney Lanier, regarded by some critics as the most important American poet of the last forty years.

Since 1870, the number of publications has been constantly and rapidly increasing, and two dominant types have appeared—the local short story and an exaggerated form of the romantic novel. As the Middle and Western States became more settled, a new type of literature arose, which was especially adapted to the new conditions. As early as 1868 a magazine, *The Overland Monthly*, had been established in San Francisco; and in it appeared the vivid, racy, unconventional story, *The Luck of Roaring Camp*, by Bret Harte. From the appearance of this tale may be dated the vogue of the short story dealing with the local conditions in various sections of the United States. Following Bret Harte, a score of writers appeared all over the country, each depicting the life and manners of his own particular section. For the most part, they emphasized local conditions by employing the dialect peculiar to their division of the country. Among the more successful of these dialect writers were Joel Chandler Harris, with his *Uncle Remus* stories; Edward Eggleston, the author of *The Hoosier Schoolmaster* (1871), and other tales of the Middle West; G. W. Cable, who so skillfully depicted the French Creole life of New Orleans; and Mary Noailles Murfree, better known under her pseudonym "Charles Egbert Craddock," whose novels of the mountain whites of Tennessee, Kentucky, North Carolina and Georgia first attracted the attention of the country to these peculiar people. But although the majority of short-story writers used dialect forms, there were a number who adhered to more conventional styles of expression, depending upon their power of characterization and the enumeration of salient details to give the necessary semblance of reality. Among these were Harold Frederic, who dealt with the crude life of West-Central New York; Hamlin Garland, who wrote of the North-West; James Lane Allen, who depicted the people of Kentucky; and Mary E. Wilkins, who with deserved success wrote her vignettes of the narrower life of New England. F. R. Stockton drew with much quaint humor some familiar and very characteristic American types in *Rudder Grange;* and Ernest Seton-Thompson described the lives of wild animals by the original and interesting method of looking at their environment from their own standpoint.

Besides these writers there were a few successful authors whose works cannot be classified under any one division. First of these is General Lew Wallace, whose *Ben Hur* (1880), a tale of the early days of Christianity, was immensely popular. It was a forerunner of the reaction against the short dialect story; for just as the psychological novel had given place to the story, so it in turn was to be superseded by the unalloyed romance. A prolific and interesting writer was Francis Marion Crawford, who was an exponent of the theory that a novel should be essentially a drama, in which descriptions should take the place of scenery. At the same time, William Dean Howells and Henry James were working along lines parallel, yet clearly separated. The former practically created the novel of American social life, with men and women rather than incidents for material; and in his stories commonplace occurrences charm, through his skillful realization of the characters. Henry James has been characterized as the "creator of the international novel." His psychology is admirable, though almost too subtle, and his style is refined to a degree. Mrs. Wharton, first noticed as a follower of Henry James, shows in her later works but little of his influence. *The Valley of Decision* (1903), a story of Italy in the eighteenth century, attracted notice. *The House of Mirth* (1905), a story of 'society' life in New York, was considered at the time the finest American novel recently written.

In 1894 *The Prisoner of Zenda*, by an English author, Anthony Hope Hawkins, being well received by a public tired of psychology and dialect, and eager for tales of adventure, in welcome contrast with the commonplace civilization of the day, made the romantic novel popular. Winston Churchill, Mary Johnston, Charles Major, Maurice Thompson, S. Weir Mitchell, Paul Leicester Ford, and many others wrote historical romances, of which hundreds of thousands of copies sold within incredibly short periods. The beginning of the twentieth century was marked by the introduction of the novel dealing with the individual who is in revolt against existing social conditions. Although this perhaps is not yet a clearly defined department of fiction, *Unleavened Bread* (1900), by Robert Grant, *A Singular Life* (1895), by Elizabeth Stuart Phelps, and *A Gentleman from Indiana* (1900), by Booth Tarkington, are all novels which show the same general tendency to emphasize individualism. The same characteristic marks the writing of Jack London, especially in *The Sea Wolf*, though usually his stories are simply frank tales of adventure.

In turning from fiction to poetry one is struck with the dearth of really important names. Among any number of versifiers, musical but commonplace, E. C. Stedman, R. H. Stoddard, T. B. Aldrich, Richard Watson Gilder, H. C. Bunner, Richard Hovey, William Vaughn Moody, and Madison Cawein are almost the only ones whose poetry has risen in the slightest degree above the ordinary level.

In historical composition there has been a marked inclination to follow the example set by the English historian, J. R. Green, and not only to weigh carefully the dramatic events of political history, but also to study with equal thoroughness the character of the people themselves. This tendency has been especially evident in the works of John Fiske, John Bach McMaster, Woodrow Wilson, and Edward Eggleston, all of whom have added much to our knowledge of conditions and men at the beginnings of our national life, and in the elaborate researches of Justin Winsor. Other historical writers of importance are James Ford Rhodes, the historian of the Civil War, and William M. Sloane, the author of a monumental biography of Napoleon.

Literary criticism has had many representatives; but since James Russell Lowell's death, American literature has found no one fitted to succeed him. The best known critics who enjoyed a certain amount of authority in late years were William Dean Howells, Henry James, Brander Matthews, George E. Woodberry, Harry Thurston Peck, William C. Brownell, James Huneker, and Paul Elmer More. In recent criticism, however, there is a note of individual preference at times almost emotional, and an absence of definite æsthetic standards, such as those which characterized the work of Sainte-Beuve in France and of Matthew Arnold in England.

In conclusion, the most important developments since 1870 are New England's loss of literary supremacy; the wide distribution of literary activity; the decline of the essay as a recognized medium of purely literary expression; the predominance of light fiction; and an unparalleled increase in the number of books, newspapers, magazines, and other periodicals.

BIBLIOGRAPHY. For the best account of Colonial and Revolutionary literature, consult: Tyler, *History of American Literature*, 4 vols. (New York, 1878-97); for a good general survey, Richardson, *American Literature* (New York, 1887-88); Nichol, *American Literature* (Edinburgh, 1882); Wendell, *A Literary History of America* (New York, 1901); C. Noble, *Studies in American Literature* (New York, 1898); Katherine Lee Bates, *American Literature* (New York, 1898); for poetry, Stedman, *Poets of America* (Boston, 1885); Stedman, *An American Anthology* (New York, 1901); for prose, Carpenter, *American Prose* (New York, 1898); for anthologies of prose and verse, Stedman and Hutchinson, *Library of American Literature* (New York, 1888-90); Duyckinck, *Cyclopædia of American Literature* (New York, 1865). The best series of monographs on American authors is the American Men of Letters Series (Boston). See also Whitcomb, *Chronological Outlines of American Literature* (New York, 1894), and Trent, *History of American Literature* (New York, 1904).

AMERICAN MERCHANT MARINE. See UNITED STATES (paragraph SHIPPING).

AMERICAN MUSE'UM OF NAT'URAL HISTORY. See MUSEUM.

AMERICAN NOTES. By Charles Dickens, published in 1842, after his first visit to the United States. They excited resentment in America.

AMERICAN PAR'TY. The name applied to three parties in the United States. The first and best known was organized in 1852, chiefly to oppose the immigration of foreigners, and had a considerable following between the years 1852 and 1856. (See KNOW-NOTHINGS.) The second party, an outgrowth of the National Christian Association, was organized in 1872 to oppose secret societies and to advocate the prohibition of the sale of intoxicants, the use of the Bible in schools, international arbitration, a direct popular vote for President, the resumption of specie payments, and general observance of Sunday. After 1888, when it cast its largest vote, it virtually went out of existence. The third party was organized in Philadelphia in September, 1887, to restrict the immigration and naturalization of foreigners, to exclude all Anarchists and Socialists from citizenship, and to prevent alien proprietorship. See Stanwood, *History of the Presidency* (Boston, 1898).

AMERICAN RIV'ER. A river in north central California (Map: California, C 2). It rises in Eldorado County and flows southwesterly toward the Sacramento River, into which it empties a little above Sacramento City. Gold has been frequently found along its banks.

AMERICAN SYC'AMORE. See PLANE.

AMERICAN SYS'TEM. See TARIFF.

AMERICAN U'NIVER'SITY. An institution of higher learning for post-graduate study under the auspices of the Methodist Episcopal Church, situated at Washington, D. C. It was chartered in 1893, and the plans include a series of colleges, specializing respectively in history, language, and literature, philosophy, the several sciences, technology, sociology, and economics, law, civics, medicine, art, and comparative religion. The plan of organization provided that for entrance to all courses, the bachelor's degree, or its equivalent in scholarship, should be required. The assets in 1905 amounted to $2,200,000. Chancellor, 1903, Bishop C. C. McCabe, D.D., LL.D.

AMERICAN WINE. See WINE.

AMER'ICUS. A city and the county seat of Sumter Co., Ga., 70 miles by rail south-southwest of Macon, at the junction of the Central of Georgia and Seaboard Air Line railroads (Map: Georgia, B 3). It is in a cotton and sugar-cane district, and has chemical works, iron foundry, and machine shops. Americus was settled in 1832, incorporated 1855, and is governed by a charter of 1889, which places the mayor's term at two years, and provides for a city council of six, elected on a general ticket, with full power of appointments. Pop., 1900, 7674.

AMERIGHI, ä'mâ-rē'gē, MICHELANGELO. See CARAVAGGIO.

AMERIGO VESPUCCI, ä'mâ-rē'gō vĕs-pōō'-chē. See VESPUCIUS, AMERICUS.

AM'ERIND. A name suggested as a designation for the American Indians (including the Eskimo and the Fuegians), as distinguished from the natives of India and the adjacent regions. It is compounded from the two words, *American* and *Indian*, and originated with Major J. W. Powell, Director of the Bureau of American Ethnology.

AMERLING, ä'mĕr-lĭng, FRIEDRICH (1803-87). An Austrian painter, born in Vienna. He studied there and at London, Paris, and Munich, and went to Italy in 1831. Upon his return he painted a portrait of the Emperor Franz I., and from that time was the most prominent of Austrian portrait painters. His portraits number not far from a thousand, and are distinguished by brilliant coloring, but sometimes fail of definiteness in characterization. Consult: Bodenstein, *Hundert Jahre Kunstgeschichte Wiens* (Vienna, 1888); and for his life, Frankl (Vienna, 1889).

AMERSFOORT, ä'mĕrz-fōrt. An ancient town in the province of Utrecht, Netherlands, 15 miles northeast of Utrecht on the Eem, which flows into the Zuyder Zee (Map: Netherlands, D 2) The town is situated in a fertile plain, at the foot of sandy hills. Tobacco is much grown in the district, and cotton and woolen goods, leather, soap, beer, etc., are manufactured. The Catholic church of St. Mary, built in the fourteenth century, has a Gothic tower 308 feet high, considered the finest in Holland. There is also a college of Jansenists in the town, it being one of the chief seats of this sect, which does not now exist outside of Holland. Pop., 1890, 15,500; 1900, 19,000.

AMES. A city in Story Co., Ia., 37 miles north of Des Moines, on the Chicago and Northwestern Railroad (Map: Iowa, D 3). It is the seat of the State College of Agriculture and Mechanic Arts (founded in 1869), which has a plant covering over a thousand acres. Among its manufactures are ploughs, wagons, etc. The electric light plant and water-works are owned and operated by the municipality. Pop., 1890, 1276; 1900, 2422; 1905, 3292.

AMES, ADELBERT (1835—). An American soldier. He was born at Rockland, Me., and graduated at West Point in 1861. He was wounded at the first battle of Bull Run, and afterward served with distinction at Malvern Hill, Antietam, Fredericksburg, Chancellorsville, Gettysburg, and Petersburg. He was brevetted (March 13, 1865) major-general of volunteers for conduct at Fort Fisher, and on July 28, 1866, became a lieutenant-colonel in the regular army. He was afterward Provisional Governor of Mississippi from 1868 to 1869, and was commandant of the Fourth Military District (including Mississippi) from 1869 to 1870, and was a United States senator from 1870 to 1873, when, in spite of the white population, he became Governor of Mississippi by popular election. His administration of affairs soon antagonized the whites, who accused him of favoritism to the negro population, and a bitter race war ensued, culminating in the Vicksburg riot of December 7, 1874, and in numerous minor conflicts between Democrats and Republicans. Finally, in 1876, the Democrats having secured a majority in the Legislature, Ames was impeached, and resigned on condition that the charges against him be withdrawn. (See article on MISSISSIPPI.) He then removed to New York, and, later, to Lowell, Mass., and during the Spanish-American War served as brigadier-general of volunteers.

AMES, FISHER (1758-1808). An American orator and Congressman. He was born at Dedham, Mass., April 9, 1758. He graduated at Harvard in 1774, began the practice of law in 1781, and soon became favorably known through his trenchant newspaper articles in condemnation of Shays's Rebellion (q.v.) and in favor of a strong government. This local reputation was increased by his efforts in favor of the Federal constitution in the Massachusetts Convention of 1788, the immediate result of which was his election to Congress, where he served for eight years, becoming known especially as an accomplished public speaker. In his later years he served in the Massachusetts Council, delivered a eulogy on Washington before the Legislature, and produced a number of essays; but he took no part in active politics. In 1804 he declined the presidency of Harvard. He died July 4, 1808. A single volume of his *Works* was published in Boston (1809), and later his son, Seth Ames, edited his writings and speeches in more extended form, with a memoir by J. T. Kirkland (Boston, 1854).

AMES, JAMES BARR (1846—). An eminent American educator and legal scholar. He was born in Boston, graduated in 1868 at Harvard and in 1872 at the Law School of the University, in 1868-69 was an instructor in a private school at Boston, and from 1871 to 1872 was tutor in German and French at Harvard. In the same institution he was appointed successively instructor in history (1872), associate professor of law 1873), and professor of law (1877). In 1895 he became Dean of the Harvard Law School. He has published various articles in the *Harvard Law Review* and similar periodicals, and has compiled and edited numerous valuable collections of cases on torts, trusts, and suretyship, and other legal questions. He received the degree of LL.D. from New York University (1898), the University of Wisconsin (1898), and the University of Pennsylvania (1899).

AMES, Joseph (1689-1759). An English antiquary and bibliographer, born at Yarmouth. He was in some sort of mercantile pursuit, and in addition to various other compilations published the *Typographical Antiquities* (1749), regarded as forming the foundation of English bibliography.

AMES, Joseph (1816-1872). An American portrait painter. He was born in Roxbury, N. H., and studied at Rome, Italy, where he painted a fine picture of Pope Pius IX. On his return to America he lived successively at Boston, Baltimore, and New York, where he was elected a member of the National Academy of Design in 1870. His best portraits are those of Emerson, Rachel, Ristori, Clarence H. Seward, Webster, Choate, and President Felton of Harvard. Among the paintings treating of ideal subjects, that entitled "The Death of Webster" is generally considered the best.

AMES, Joseph Sweetman (1864—). An American physicist and educator, born at Manchester, Vt. He graduated in 1886 at the Johns Hopkins University, and became professor of physics there. He was elected an honorary member of the Royal Institution of Great Britain, has edited (New York, 1898) J. von Fraunhofer's memoirs on *Prismatic and Diffractive Spectra*, and has published *The Theory of Physics* (1897), *Elements of Physics* (1900), and *The Induction of Electric Currents* (2 volumes, 1900).

AMES, Mary Clemmer (1839-84). An American author, best known by her "Woman's Letter from Washington," contributed for many years to the New York *Independent*. She was born at Utica, New York, and at an early age married the Rev. Daniel Ames, from whom she was divorced in 1874. In later life she removed to Washington, where her home was a literary and social centre, and in 1883 she married Edmund Hudson, editor of the *Army and Navy Register*. Her works include *Eirene*, a novel (1870), *Ten Years in Washington* (1871), and *Memorials of Alice and Phœbe Cary* (1872), of whom she had been an intimate friend. Her complete works were published at Boston, 4 volumes (1885). Consult Hudson, *Memorial Biography of Mary C. Ames* (Boston, 1886).

AMES, Nathan P. (1803-47). An American manufacturer of firearms, ordnance, and cutlery. In early life he owned extensive cutlery works at Chicopee Falls, Mass., but afterward removed to Cabotsville. The works were supplemented in 1836 by a bronze foundry, where most of the brass guns for the United States Army were cast. There also the statues of DeWitt Clinton, in Greenwood Cemetery, Brooklyn; of Washington, in Union Square, New York; and of Franklin, in School Street, Boston, were cast.

AMES, Oakes (1804-1873). An American manufacturer and legislator. He was born at Easton, Mass., and at an early age entered his father's workshop, where he soon familiarized himself with every detail of the shovel business, which, upon the discovery of gold in California and the impetus thereby given to railroad building, soon became a most important industry. In 1864, after others had failed, he was called upon by President Lincoln and others to build the Union Pacific Railroad, which great undertaking he successfully completed on May 10, 1869. He had invested $1,000,000 in the enterprise, and had pledged the remainder of his fortune for the same purpose. He was censured by the Forty-second Congress for participation in the Credit Mobilier scheme, but afterward was vindicated in a resolution passed by the Massachusetts Legislature (May 10, 1883). From 1862 to 1873 he represented the second Massachusetts district in Congress. He bequeathed $50,000 to children of North Easton, Mass. A fine monument in his memory was erected by the Union Pacific Railroad at Sherman, Wyoming, the highest point reached by the railroad.

AMES, Oliver (1831-95). The thirty-first governor of Massachusetts, a son of Oakes Ames (q.v.). He was trained in his father's manufactory, and upon his death undertook the discharge of the numerous financial obligations incurred by the building of the Union Pacific Railroad and other enterprises, paying within a few years debts aggregating millions of dollars. In 1882 he was chosen Lieutenant-Governor of Massachusetts, serving for four successive terms, and in 1886 was elected Governor, to which office he was reëlected in 1887 and 1888.

AMES, William (1576-1633). An English Puritan clergyman and writer on moral philosophy, born in the county of Norfolk. He studied at Christ College, Cambridge, and was professor of theology in the University of Franeker, Friesland, from 1622 to 1632. His best-known work is *De Conscientia, eius Iure et Casibus* (1632).

AMESBURY, ămz′bĕr-ĭ. A town in Essex Co., Mass., on the Boston and Maine Railroad, 42 miles northeast of Boston (Map: Massachusetts, F 2). It has a public library of 11.000 volumes, and extensive manufactures of carriages, hats, shirts, cotton goods, automobile bodies, automobile lamps, thermometers, reed and rattan goods, mirrors and reflectors, motor boats and dories, brass castings, etc. The government is administered by town meetings, held annually. Originally a part of Salisbury, Amesbury was virtually separated as New Salisbury in 1654, and was incorporated in 1666, and named (from Amesbury, England) in 1667. John Greenleaf Whittier (q.v.) lived here from 1836 until his death in 1892. Pop., 1890, 9798; 1900, 9473; 1905, 8840. Consult: J. Merrill, *History of Amesbury* (Haverhill, 1880.)

AM′ETHYST (Gk. *ἀμέθυστος*, *amethystos*, a remedy against drunkenness, from *ἀ*, *a*, priv. + *μέθυ*, *methy*, wine). A violet blue or bluish violet variety of quartz, the color of which is believed to be due to manganese oxide. It is one of the most esteemed varieties of quartz, and is much employed for seals, rings, and other articles of jewelry. The ancients imagined it to possess the property of preventing drunkenness, and those addicted to that habit wore it on their persons. Amethyst frequently occurs lining the interior of balls or geodes of agate, and in veins and cavities in various rocks. The finest specimens are from Scotland, Siberia, India, and Ceylon. In the United States the amethyst is found in many localities, but seldom of sufficient clearness or color to be used as a gem. The Lake Superior crystals, from the slaty formations around Thunder Bay, are perhaps the best known, and annually thousands of dollars worth is sent from this locality to be sold at Niagara Falls, and other tourist resorts. The Oriental amethyst is a purple variety of corundum.

AM′ETRO′PIA (Gk. *ἀ*, *a*, priv. + *μέτρον*, *metron*, measure, or *ἀμέτρος*, *ametros*, disproportionate + *ὤψ*, *ōps*, eye). A condition of the eye such that when it is resting parallel rays of light reaching it are focused either in front of or behind instead of upon the retina. It is the reverse of emmetropia, the condition of the normal eye. See HYPEROPIA; MYOPIA; ASTIGMATISM; VISION.

AMGA, ȧm-gä′. A river in the territory of Yakutsk, Siberia, rising in the Yablonoi Mountains, running north-northeast, and joining the Aldan, a tributary of the Lena (Map: Asia, N 2).

AMHARA, ȧm-hä′rȧ (the high lands). The central division of Abyssinia, occupying the territory around Lake Tsana (Map: Africa, H 3). The capital is Gondar (q.v.) See AMHARIC LANGUAGE.

AMHARIC (ȧm-hä′rĭk) **LAN′GUAGE.** A modern Semitic dialect which derives its name from the people of Amhara (q.v.), one of the divisions of Abyssinia. Next to the Arabic, Amharic is the most widely spread of the Semitic languages. It has displaced in popular usage the original language of Abyssinia, the Ethiopic or Geez, and is now the spoken tongue, whereas the Geez is the religious tongue. For many years Amharic had no writing, so that it changed very much in its forms, conjugations, and even in the meanings of its roots. Moreover, its vocabulary received non-Semitic additions from the surrounding African tribes. Hence it is that Amharic is the least Semitic of the Semitic languages, and this appears very strongly in the syntax. When the Amharic language began to be written, the Ethiopic or Geez letters were used. In this way something resembling a literature has grown up in comparatively modern times. There is an Amharic Bible, prepared by missionaries, and we have a few texts, such as Guidi's *Le Canzoni geez-amarina in onore di Rè Abissini* (Rome, 1889); of grammars there are Ludolph's (Frankfort, 1698); Isenberg's (London, 1842); Massaja's (Paris, 1867); Prätorius (Halle, 1879); Guidi (Rome, second edition, 1892); of dictionaries, Isenberg's (London, 1841); A. d'Abbadie's (1881). See AFRICAN LANGUAGES.

AM′HERST. A district of Lower Burma (q.v.), British India.

AMHERST. A town in Hampshire Co., Mass., 98 miles west of Boston, on the Boston and Maine and Vermont Central railroads (Map: Massachusetts, C 3). The scenery is picturesque, with beautiful views of the Connecticut Valley, Mount Holyoke, and other mountains. It is the seat of Amherst College, and of the Massachusetts Agricultural College (q.v.). Straw hat manufacture is the principal industry. Probably settled as early as 1703, Amherst was part of Hadley, and was known successively as New Swamp, Hadley Farms, East Farms, and East Hadley until, in 1759, it was incorporated as a district under its present name, given by Governor Pownall in honor of General Jeffrey Amherst (q.v.). In 1776 it became a town. The government is administered by town meetings. Pop., 1890, 4512; 1900, 5028; 1905, 5313. See Carpenter and Morehouse, *The History of the Town of Amherst* (Amherst, 1896); Walker, *Historic Homes of Amherst* (Amherst, 1905).

AMHERST. A port of entry and the capital of Cumberland County, Nova Scotia, Canada, near the head of Cumberland Basin, and on the Inter-Colonial Railway (Map: Nova Scotia, E 4). It is 138 miles by rail north by west of Halifax. It has car shops, woolen mills, boot and shoe factories, foundries, and trunk factories. An important trade in lumber also is carried on. Population in 1901, 4964; 1906 (local est.), 7200.

AMHERST, JEFFREY, BARON (1717-79). An English soldier. He was born at Riverhead, Kent, and for some time was a page in the household of the Duke of Dorset. He entered the army as ensign in 1731, soon became an aide-de-camp of General Ligonier, and in the War of the Austrian Succession served at Dettingen, Fontenoy, and Roncoux, and in the Seven Years' War at Hastenbeck. In 1758 Pitt raised him from the rank of lieutenant-colonel to that of major-general, and put him in command of the expedition against Louisburg, which, after a short siege, surrendered on July 27. In September he replaced Abercromby as commander-in-chief of the English forces in America; and in 1759 led the expedition against Ticonderoga and Crown Point, gaining possession of the former July 23, and of the latter August 1. In the following year he commanded in person the forces before Montreal, and on September 8 compelled the French to capitulate and surrender Canada with all its dependencies to the British crown. For his services he was appointed Governor-General of British North America, was formally thanked by Parliament, and was made a Knight of the Bath. Having no knowledge of Indian warfare, and scorning to avail himself of the undisciplined colonial militia, he proved unfit for the task of suppressing the conspiracy of Pontiac (q.v.), and returned to England in 1763, where, as the conqueror of Canada, he was received with the greatest enthusiasm. He was absentee Governor of Virginia from 1763 to 1768, was appointed Governor of Guernsey in 1770, and became a Privy Councillor in 1772. From 1772 to 1782, and from 1783 to 1793 he was acting Commander-in-chief of the British Army. He became a general in 1778, was Commander-in-Chief 1793 to 1795, and was made a Field-Marshal in 1796. For his record as an officer in America, consult: Parkman, *Montcalm and Wolfe* (Boston, 1884); and *The Conspiracy of Pontiac* (Boston, 1851).

AMHERST, WILLIAM PITT, EARL OF (1773-1857). A British diplomatist and statesman. He succeeded his uncle Jeffrey as Baron Amherst in 1797. In 1816 he was sent as ambassador to China, where he refused to perform what he thought a degrading act of kneeling, which was required of all who would see the Emperor. For this he was not allowed to enter Peking, and the object of his mission was frustrated. On the way home he was wrecked. Another ship, in which he returned, touched at St. Helena, where he had several interviews with Napoleon. He was Governor-General of India, from 1823 to

1828, and for his services in conducting the first Burmese War he was created an earl in 1826.

AM′HERSTBURG. A town and port of entry in Ontario, Canada, on the Detroit River, four miles above Lake Erie, and on the Michigan Central Railroad (Map: Ontario, A 5). The town has steamer connection with Detroit, Mich. It has a public library, and is the seat of a United States consulate. The stone-quarrying interests are important. Amherstburg is one of the oldest settlements in Upper Canada. It was dismantled by the British (September 26, 1813), and destroyed by General Harrison, of the United States Army, a week later. Pop., 1901, 2222; 1905 (local est.), 2480.

AM′HERST COL′LEGE. A leading American college, situated at Amherst, Mass., and founded in 1821 by Congregationalists in the interest of Christian education. Up to the year 1906 the graduates numbered 4700, of whom 1411 entered the clergy, while an equally large number became teachers. The unusual educational influence wielded by Amherst for half a century was due to a considerable extent to two of its presidents, Edward Hitchcock and Julius H. Seelye. The former was probably the most distinguished American geologist of his time, and the latter united with a broad scholarship in the humanities great ability as a practical educator. Amherst has never endeavored to branch out as a university, but has steadily increased in efficiency as a non-specialized and non-technical liberal college. In 1906 the faculty numbered 40, and the students 460. The total value of the buildings and grounds is about $1,600,000; the interest of over $300,000 is used to aid needy students; the annual income of the college is about $120,000, and the entire property under the control of the college aggregates $2,500,000. The library contains 75,000 volumes, and is the largest belonging to any purely collegiate institution in the country. Of accessories to the college may be mentioned the Hitchcock ichnological cabinet, the Adams collection in conchology, the Shepard meteoric collection, and an extensive and valuable geological and mineralogical collection gathered largely by the personal efforts of Professor Benjamin K. Emerson. The Pratt Gymnasium, athletic field, and college hospital are the gifts of the sons of the late Charles Pratt of Brooklyn, N. Y. The presidents have been: Zephaniah Swift Moore, D.D., 1821-23; Heman Humphrey, D.D., 1823-45; Edward Hitchcock, D.D.,LL.D., 1845-54; William A. Stearns, D.D., LL.D., 1854-76; Julius H. Seelye, D.D., LL.D., 1876-90; Merrill Edwards Gates, LL.D., Ph.D., 1890-99; George Harris, D.D., LL.D., 1899. Consult Tyler, *A History of Amherst College* (New York, 1896).

AM′ICABLE NUM′BERS (Lat. *amicabilis*, friendly). Two numbers, each of which is the sum of the factors of the other, are called amicable numbers, as 220 and 284, e.g.:

$$220=1+2+4+71+142$$
$$284=1+2+4+5+10+11+20+22+44+55+110$$

The classification and fanciful name are due to the Pythagoreans, who made much of number mysticism.

AMICE, ăm′ĭs. See COSTUME, ECCLESIASTICAL.

AMICI, ȧ-mē′chē, GIOVANNI BATTISTA (1786-1864). An Italian astronomer and optician. He was born at Modena, where he was afterward professor of mathematics at the University. In 1831 he was appointed superintendent of education, and subsequently became director of the observatory and professor of astronomy at Florence. The various pieces of physical and astronomical apparatus designed or constructed by him include a reflecting telescope, an achromatic microscope, polarization apparatus, a micrometer for telescopes, and a reflecting prism. He published papers on observations on double stars, the moons of Jupiter, the sun, and on various botanical subjects, such as the circulation of the sap in plants.

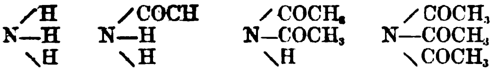
AMICIS, ȧ-mē′chēs, EDMONDO DE (1846—). One of the most popular of living Italian authors. He was born at Oneglia, in Liguria, October 21, 1846. In 1861 he graduated from the military academy at Modena, with the rank of sub-lieutenant, and five years afterward participated in the battle of Custozza. For a while he edited a Florentine journal, *L'Italia Militare*, and subsequently took part in the Roman occupation of 1870; but having achieved some success with a volume of sketches of army life, *Bozzetti* (1868), he abandoned both the military and the journalistic career, and undertook a series of voyages to England, Holland, Spain, Africa, Turkey, and South America. Almost all these gave him material for brilliant and widely popular volumes of travel, such as *La Spagna* (1873), *Ricordi di Londra* (1874), *L'Olanda* (1874), *Marocco* (1875), and *Constantinopoli* (1877). These volumes have been translated into many languages. They show a keen power of observation, a genial humor, and a broad spirit of tolerance, which would justify their popularity even without the warm coloring and glowing vividness of description, in which respect his style challenges comparison with that of Théophile Gautier. Other writings include *Ritratti letterari* (1881), a series of personal impressions of well-known writers, including Zola and Dumas *fils*; a sympathetic and semi-humorous volume on friendship, *Gli Amici* (1882), and a number of historical novelettes, collected under the title, *Alle porte d'Italia* (1888). Of recent years De Amicis has become deeply interested in educational and economic questions, and in many ways his greatest literary success is a simple little volume, *Cuore* ("The Heart of a Boy"), intended primarily for children, and recording the events of a single school year as told from day to day by one of the pupils. In Italy it has passed through 300 editions, and it has been translated into twenty languages. Educational problems have also given De Amicis his subject for his more serious attempt at fiction, *La maestrina degli operai* (1895), and *Il romanzo d'un maestro* (1895). The last-named volume shows a strong tendency towards socialism which he openly avowed and regarded as a valuable source of literary inspiration. His later volumes are *Memorie* (1899), *Speranza e glorie* (1900), *Ricordi d'infanzia e di scuola* (1901), *Lotte civili*, a defense of socialism (1901), *Capo d'anno* (1901), *Un salotto fiorentino del secolo scorso* (1902), *Nel giardino della follia* (1902), *L'idioma gentile* (1904), *Nel regno del cervino* (1905).

AMI′CUS CU′RIÆ (Lat., friend of the court). One, usually a counselor at law, who volunteers information, or gives it at the request of the court, upon some matter of law in regard to which the judge is doubtful, or information upon matters of fact of which the court may take judicial cognizance. The amicus curiæ cannot add anything to the record or increase the power of the court to dispose of the matter in hand. The amicus curiæ in general has no control over an action, as does the attorney of record; but in some cases, as when letters of administration have been issued without authority, he may move to set the proceeding aside. By an early English statute the amicus curiæ was permitted to move to quash an improper indictment.

AM'IDAS, PHILIP. See AMADAS, PHILIP.

AM'IDAVAD' (*amadavat*, Indian name; the bird was first imported from the city of Ahmedabad). A cage-bird (*Estrilda amandava*), one of the small weaver-finches of India, having a pretty song and a social disposition, so that it is a favorite for aviaries. The plumage is most brilliant, the prevailing colors being fiery red, black, and yellow. It requires the food and care given to a canary. See CAGE-BIRDS.

AM'IDES, or **AC'ID AM'IDES** (derived from *ammonia*). An interesting class of organic compounds formed by the substitution of organic acid radicles for one or more hydrogen atoms in ammonia (NH_3). If one of the hydrogen atoms of ammonia is replaced by an acid radicle, the resulting compound is termed a primary amide; if two acid radicles are introduced into the molecule of ammonia, a secondary amide is obtained; finally, if all the three hydrogen atoms of ammonia are replaced by acid radicles, a tertiary amide is obtained. The relation of these three sub-classes of amides to ammonia is shown by the following formulæ, representing compounds containing one or more acetyl groups (radicles of acetic acid):



Ammonia Acetamide (a primary amide) Di-acetylamide (a secondary amide) Tri-acetylamide (a tertiary amide)

Amides are also subdivided into fatty and aromatic amides, according as their acid radicles are derived from fatty or from aromatic acids; thus, acetamide (corresponding to acetic acid) is a fatty amide, while benzamide (derived from benzoic acid) is an aromatic amide.

The primary amides are by far more numerous and important than the secondary or tertiary amides. From the above it is evident that their molecule consists of two parts: viz., one acid radicle and the group NH_2. A number of interesting derivatives of the amides have been obtained by replacing the hydrogen of the latter group. Thus, from acetamide, CH_3CONH_2, compounds may be readily obtained, represented by the following formulæ: $CH_3CONH(CH_3)$—methyl-acetamide; $CH_3CON(CH_3)_2$—di-methyl-acetamide; $CH_3CONHAg$—silver-acetamide; $CH_3CONHBr$—bromine-acetamide, etc.

The following are the principal general methods by which primary acid amides may be prepared:

1. When the ammonium salts of many fatty organic acids are distilled, they lose the elements of water, and the corresponding amides are formed. Thus, acetamide is made by distilling ammonium acetate, the reaction taking place according to the following chemical equation:

$$CH_3COONH_4 - H_2O = CH_3CONH_2$$

Ammonium acetate Acetamide

2. The chlorides of acid radicles are treated with ammonia. Thus, benzamide (the amide of benzoic acid) is readily prepared by slowly adding benzoyl chloride to strong ammonia in the cold, the reaction taking place as follows:

$$C_6H_5COCl + NH_3 = C_6H_5CONH_2 + HCl$$

Benzoyl chloride Ammonia Benzamide Hydrochloric acid

When acid amides are boiled with dilute acids or alkalies, they take up the elements of water and are reconverted into the ammonium salts of the corresponding acids. Thus, acetamide yields ammonium acetate, according to the following equation:

$$CH_3CONH_2 + H_2O = CH_3COONH_4$$

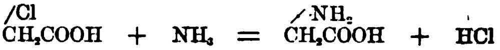
Acetamide Ammonium acetate

The amides are all soluble in alcohol and in ether, and many are more or less soluble in water. Most of them are solid crystalline substances that can be distilled without decomposition.

The *acid amides* should be distinguished from the *amido-acids;* compounds of the latter class may be obtained by treating the halogen-substitution products of acids with ammonia, while, as stated above, the acid amides are produced by the action of ammonia on the chlorides of acid radicles. The following two equations may serve to show the formation of, and the difference in chemical constitution between, an acid amide and an amido-acid:

$$CH_3COCl + NH_3 = CH_3CONH_2 + HCl$$

Acetyl chloride Acetamide



$$CH_2\overset{/Cl}{}COOH + NH_3 = CH_2\overset{/NH_2}{}COOH + HCl$$

Mono-chloro-acetic acid Amido-acetic acid

AM'IDO-AC'IDS. See AMIDES.

AMID'SHIP, or MIDSHIP. See SHIPBUILDING.

AMIEL, à'myĕl', HENRI FRÉDÉRIC (1821-81). A Swiss essayist, poet, and professor of æsthetics. He was born at Geneva, September 27, 1821, and died there, May 11, 1881. He is remembered almost solely for his *Journal intime*, a diary of 1700 pages of manuscript, posthumously published in part in 1883-84 and translated into English in 1889, with a critical study by Mrs. Humphry Ward. This journal, through its singular clearness, keenness of insight, and sensitiveness to impression, is the complete revelation of a cast of mind that felt itself peculiarly modern and peculiarly entitled to be self-distressed. It expresses with masterful passion and original power the spiritual yearning and despair of a pure soul gasping in a rationalistic atmosphere. Thus Amiel is a curious projection into reality of the Shakespearean Hamlet, in whom morbid introspection numbs action. He is more fascinating than stimulating, more sombre than pessimistic, more subtle than strong. His thoughts will be cherished for the beauty of their form rather than for any tonic quality in their teaching. There is a *Life of Amiel*, by Vadier (Paris, 1885). Consult also, Bourget, *Nouveaux Essais* (Paris, 1885).

AMIENS, ȧ′myäN′ (From the Lat. *Ambiani*, the name of a Belgic tribe; literally "dwellers on the water;" compare Gadhel. *abhain, abhuinne*, water, a river). The capital of ancient Picardy and of the present French department of Somme, situated on the River Somme, 81 miles by rail from Paris (Map: France, J 2). The residential section is well built with wide, well-paved streets and fine squares. The business part of the town is crossed by several canals, and is rather unattractive. The old town is surrounded with boulevards, which occupy the site of the ancient fortifications, and there is in the western part of the town an extensive pleasure ground, the Promenade de la Hotoie, used for public concerts and festivals. The world-famous cathedral is situated in the eastern part of the city, facing the Place Nôtre Dame. Besides being the largest ecclesiastical edifice of France, the cathedral of Amiens is also one of the finest specimens of Gothic architecture in Europe. Its construction was begun in 1220 by the architect Robert de Luzarches, and was continued by Thomas de Cormont and his son Renault. It was finished in 1288, but many additions have been made since; the two side towers of the western façade, however, are still unfinished. The length of the cathedral is 470 feet, that of the transept 213 feet, and the width of the nave 144 feet. The main façade has three lofty porches profusely decorated with statuary and other sculptural ornaments. The central spire over the transept is very slender, and 360 feet in height. The interior is also very imposing. The nave is 147 feet high, and the vaulting is supported by 126 columns. There are numerous chapels, and the transepts are covered with fine reliefs. At the sides of the nave are placed bronze statues of the two founders of the cathedral, and there are also large marble statues at the entrance to the choir. Besides the cathedral the most noteworthy buildings are the town hall and the Château d'Eau, where the water works of the city are situated. Of educational establishments Amiens has a lyceum, a medical school, a theological seminary, a municipal library, with about 100,000 volumes and nearly 600 manuscripts, and the museum of Picardy, containing collections of antiquities, sculptures, and paintings. Amiens was of considerable industrial importance as early as the twelfth century, and in the sixteenth century it became one of the largest centres of the textile industry in France. At present the chief manufactures of Amiens are linen, woolens, silk, plush, and shoes. Amiens is the seat of a bishop and of a court of appeals. Pop., 1901, 90,758.

Amiens was anciently known as Samarobriva, and was the capital of the Gallic Ambiani. Cæsar included it in Gallia Belgica, and it became a Roman stronghold; Marcus Aurelius adorned it. In the fifth century it fell into the hands of the Franks. In 1185 Philip Augustus, in consolidating the kingdom, induced Philip of Alsace to cede it to the crown. The famous Treaty of Amiens between Great Britain on one side and France, Spain, and the Batavian Republic on the other, in which Great Britain recognized the changes made by France in the map of Europe, and gave up most of her recent conquests, was signed in the Hôtel de Ville on March 27, 1802. Among notable men born in this city was Peter the Hermit.

AMINA, ȧ-mē′nȧ. In Bellini's opera, *La Sonnambula*, the heroine, an orphan, who walked in sleep.

AMIN′ADAB SLEEK. See SLEEK, AMINADAB.

AMINE, ȧ-mēn′. The name of two characters in the *Arabian Nights*. (1) In the *History of Sidi Nouman*, his wife, whose habit of eating only so much rice as she could pick up on a bodkin excited his suspicions, and who, he discovered, partook of ghoulish feasts in the cemetery. She used also to lead her three sisters about like hounds. (2) In the story of *Three Ladies of Bagdad*, the half-sister of Zobeide and wife of Amin, the Caliph's son, who becomes estranged from her, but is reconciled.

AM′INES (Derived from *ammonia*). A general term applied in organic chemistry to an important class of basic compounds derived by substituting hydro-carbon radicles like methyl (CH_3), ethyl (C_2H_5), etc., for one or more of the hydrogen atoms of ammonia (NH_3). The compound CH_3NH_2 is called methyl-amine; the compound $(CH_3)_2NH$ — di-methyl-amine; the compound $(CH_3)_3N$ — tri-methyl-amine. An amine derived by replacing one hydrogen atom of ammonia is called a *primary amine;* one derived by replacing two hydrogens is called a *secondary amine;* finally, one derived by replacing all of the hydrogen of ammonia is called a *tertiary amine*. The three compounds just mentioned are examples, respectively, of primary, secondary, and tertiary amines.

The amines may be readily prepared by the action of halogen substitutive products of the hydrocarbons upon ammonia (Hofmann's method). Thus, by the action of mono-iodo-ethane (ethyl iodide) upon ammonia, one or more ethyl groups (C_2H_5) are introduced into the molecule of ammonia (NH_3), according to the following chemical equations, which usually take place simultaneously:

$$1.\quad \underset{\text{Ethyl-iodide}}{C_2H_5I} + \underset{\text{Ammonia}}{NH_3} = \underset{\text{Ethyl-amine}}{C_2H_5NH_2} + \underset{\text{Hydriodic acid}}{HI}$$

$$2.\quad 2C_2H_5I + NH_3 = \underset{\text{Di-ethyl-amine}}{(C_2H_5)_2NH} + 2HI$$

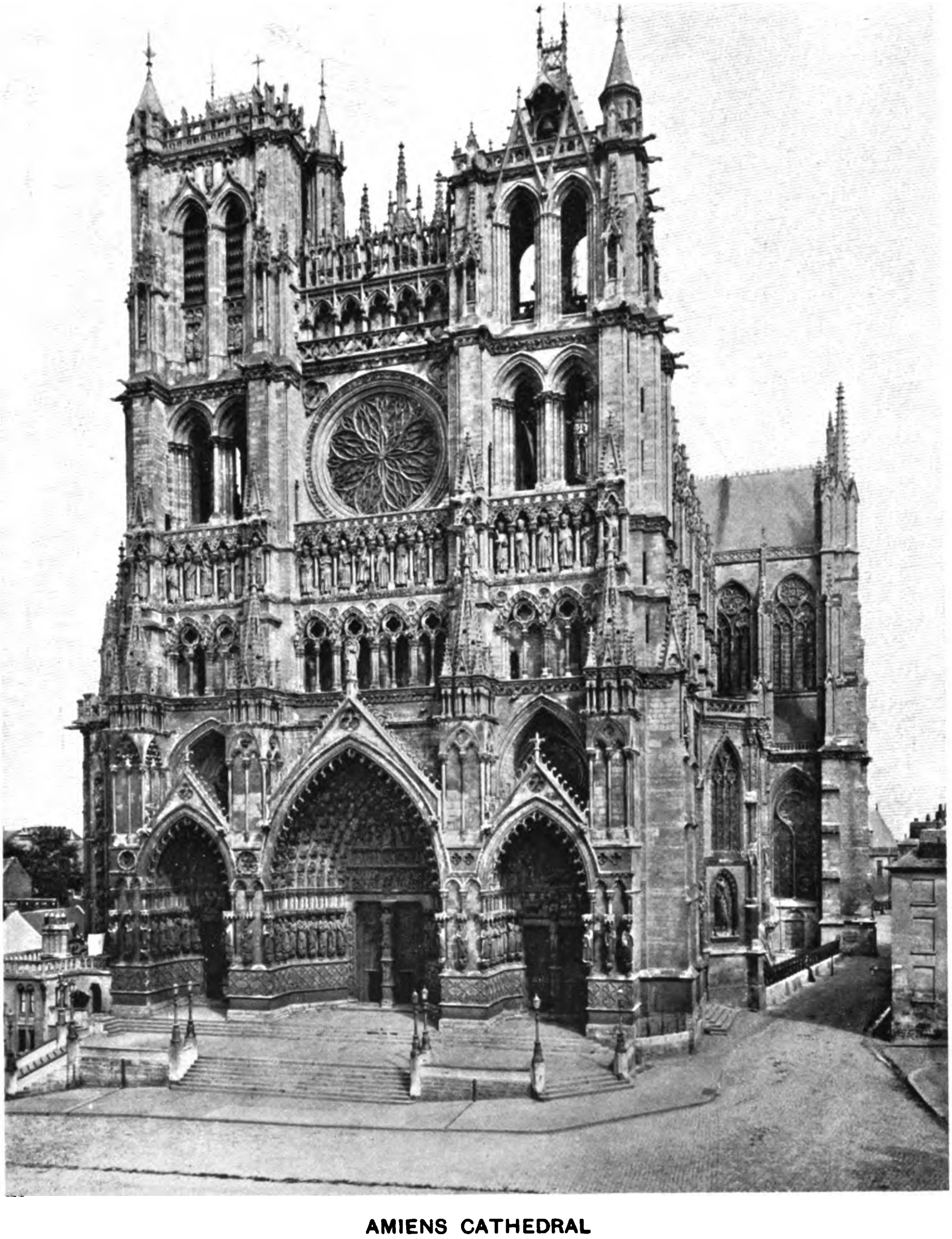
$$3.\quad 3C_2H_5I + NH_3 = \underset{\text{Tri-ethyl-amine}}{(C_2H_5)_3N} + 3HI$$

As the amines are powerful bases, they combine, of course, with the hydriodic acid formed in these reactions, producing salts like $C_2H_5NH_2HI$, from which the amines are readily isolated by distilling with caustic alkalies.

Simultaneously with the above three reactions, a fourth reaction takes place: viz., between the halogen substitution product of the hydrocarbon and the tertiary amine produced in the third reaction. This fourth reaction, in the case of tri-ethyl-amine, is represented by the following equation:

$$4.\quad \underset{\text{Ethyl-iodide}}{C_2H_5I} + \underset{\text{Tri-ethyl-amine}}{(C_2H_5)_3N} = \underset{\text{Tetr-ethyl-ammonium iodide}}{(C_2H_5)_4NI}$$

The compound formed in this reaction is evidently ammonium iodide (H_4NI), all the hydrogen of which has been replaced by ethyl-groups (C_2H_5); it is therefore named tetr-ethyl-ammonium-iodide. When treated in aqueous solution with silver hydroxide, it is transformed into tetr-



AMIENS CATHEDRAL

ethyl-ammonium hydroxide, according to the following equation:

$$(C_2H_5)_4NI + AgOH = (C_2H_5)_4NOH + AgI$$

Tetr-ethyl-ammonium iodide — Tetr-ethyl-ammonium hydroxide

just as ammonium iodide is transformed into ammonium hydroxide:

$$H_4NI + AgOH = H_4NOH + AgI$$

Ammonium iodide — Ammonium hydroxide

Bases like $(C_2H_5)_4NOH$, derived from ammonium hydroxide by substituting hydrocarbon radicles like methyl (CH_3), ethyl (C_2H_5), etc., for all of its hydrogen, are termed *quaternary ammonium bases*.

The above method of preparation of the amines and the substituted ammonium salts may also serve in determining the nature of an amine. An example will render this clear: an amine found in herring-brine has the molecular formula C_3H_9N; is it the primary amine $C_3H_7NH_2$ (propyl-amine), or the tertiary amine $(CH_3)_3N$ (tri-methyl-amine)? To answer this question the amine may be treated with methyl iodide, and, when the reaction is completed, the resulting substance analyzed. The formation, as a final product of the reaction of the compound $C_4H_{12}NI$, proves that the substance C_3H_9N, found in herring-brine, is a tertiary amine $(CH_3)_3N$, for only one methyl group (CH_3) is required to transform it into the substituted ammonium iodide $C_4H_{12}NI$ [$(CH_3)_4NI$]; while if it were the primary amine, $C_3H_7NH_2$, the number of methyl-groups taken up would be three, and the compound $C_6H_{16}NI$ [$C_3H_7(CH_3)_3NI$] would be formed. The number of groups, like methyl, ethyl, etc., taken up by an amine thus generally determines its nature.

The nature of amines is also shown by their behavior toward nitrous acid, the three sub-classes of amines being characterized as follows:

1. Primary amines are converted by nitrous acid into the corresponding alcohols; thus, ethyl-amine is transformed into ethyl alcohol, according to the following chemical equation:

$$C_2H_5NH_2 + HNO_2 = C_2H_5OH + H_2O + N_2$$

Ethyl-amine — Nitrous acid — Ethyl alcohol

just as ammonia is transformed into water:

$$NH_3 + HNO_2 = H_2O + H_2O + N_2$$

Ammonia — Nitrous acid — Water

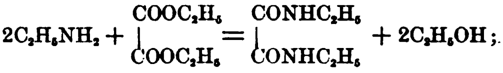
2. Secondary amines are converted by nitrous acid into compounds containing the group NO, and called *nitroso-amines;* thus, di-ethyl-amine, $(C_2H_5)_2NH$, is transformed into ethyl-nitroso-amine, according to the following equation:

$$(C_2H_5)_2NH + HNO_2 = (C_2H_5)_2N.NO + H_2O$$

Di-ethyl-amine — Ethyl-nitroso-amine

3. Tertiary amines are not affected by nitrous acid.

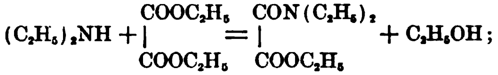
It has been stated above that when ethyl-iodide or similar substances are treated with ammonia, four reactions take place simultaneously, and a mixture of four compounds is obtained: viz., the salts of a primary, a secondary, and a tertiary amine, and a substituted ammonium iodide. The separation of the four compounds may be effected by the following method: (1) The mixture is distilled with caustic potash, which leaves the substituted ammonium iodide undecomposed as a residue, while the salts of the three amines are decomposed, and a mixture of the amines in the free state passes over in the distillate. (2) When the distillate is treated with ethyl-oxalate, the primary amine (say, ethyl-amine) is converted into a derivative of *oxamide* (the amide of oxalic acid, $\left(\begin{array}{l}CONH_2\\ |\\ CONH_2\end{array}\right)$, according to the following equation:



$$2C_2H_5NH_2 + \begin{array}{l}COOC_2H_5\\ |\\ COOC_2H_5\end{array} = \begin{array}{l}CONHC_2H_5\\ |\\ CONHC_2H_5\end{array} + 2C_2H_5OH;$$

Ethyl-amine — Ethyl-oxalate — Ethyl-oxamide — Alcohol

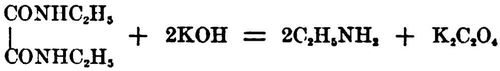
while the secondary amine (say, di-ethyl-amine) is converted into a derivative of *oxamic acid* (the amide of oxalic acid, $\left(\begin{array}{l}CONH_2\\ |\\ COOH\end{array}\right)$, according to the following equation:



$$(C_2H_5)_2NH + \begin{array}{l}COOC_2H_5\\ |\\ COOC_2H_5\end{array} = \begin{array}{l}CON(C_2H_5)_2\\ |\\ COOC_2H_5\end{array} + C_2H_5OH;$$

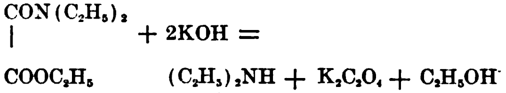
Di-ethyl-amine — Ethyl-oxalate — Ethyl-di-ethyl-oxamate — Alcohol.

the tertiary amine is not affected by treatment with ethyl-oxalate, and as it is much more volatile than both ethyl-oxamide and ethyl-di-ethyl-oxamate, it may be readily separated from these compounds by distillation. Finally, the two compounds derived respectively from the primary and secondary amines may be readily separated, since ethyl-oxamide is solid, while ethyl-di-ethyl-oxamate remains liquid on cooling the mixture. The primary and the secondary amines may be obtained separately in the free state by distilling the substances thus separated with caustic potash, the reactions taking place, respectively, according to the following two equations:



$$\begin{array}{l}CONHC_2H_5\\ |\\ CONHC_2H_5\end{array} + 2KOH = 2C_2H_5NH_2 + K_2C_2O_4$$

Ethyl-oxamide — Ethyl-amine — Potassium oxalate



$$\begin{array}{l}CON(C_2H_5)_2\\ |\\ COOC_2H_5\end{array} + 2KOH = (C_2H_5)_2NH + K_2C_2O_4 + C_2H_5OH$$

Ethyl-di-ethyl-oxamate — Di-ethyl-amine — Potassium oxalate — Alcohol

The amines are much more powerful bases than ammonia. Their odor resembles that of ammonia, from which, however, the gaseous amines may be readily distinguished by their inflammability. Many liquid and solid amines, too, have been obtained. All of the amines known have been made by artificial chemical processes, and certain amines are found among the products of decomposition of nitrogenous substances. The quaternary ammonium bases (such as tetr-ethyl-ammonium-hydroxide) are similar, and even more powerful in their action than caustic potash.

Amines containing a benzene-nucleus are classed with the so-called aromatic compounds of organic chemistry, and are subdivided into *amido-compounds* and *aromatic amines* proper, according as their nitrogen is linked to the nucleus immediately, or through the medium of CH_2-groups. Ordinary aniline is an example of an amido-compound, its formula being C_7H-NH_2. Benzylamine, $C_6H_5CH_2NH_2$, is a true aromatic amine. The aromatic amido-compounds undergo an interesting transformation when treated with nitrous acid in the cold, the resulting substances being known as *diazo-compounds* (q.v.).

AMIN'TA. A celebrated pastoral play by Torquato Tasso, produced at Ferrara in 1573. It is an allegory, presenting the characters of the court where Tasso lived.

AMINTE, ä'mäɴt'. (1) In Molière's *Les précieuses ridicules* (q.v.), the sentimental name taken by the girl Cathos. (2) A character in Molière's *L'Amour médecin.*

AMIN'TOR. The hero of Beaumont and Fletcher's *Maid's Tragedy* (q.v.), a young nobleman who, though betrothed to Aspatia, yet by the king's command marries Evadne, the heroine.

AMIOT, à'myō'. See Amyot.

AMIRANTE, ăm'ĭ-rănt', or **AD'MIRAL, IS'LANDS.** A group of islets in the Indian Ocean in lat. 5° S. and long. 53° E. They belong to Great Britain and are dependencies of Mauritius. There is a small population, chiefly engaged in fisheries.

AMIS ET AMILES, à'mē' zā à'mēl', also called Amis et Amiloun. A *chanson de geste,* dating from the twelfth or thirteenth century. It consists of about 3500 verses, chiefly decasyllabic. Amis and Amiles are two noble knights whose close resemblance and whose friendship and mutual sacrifices are the theme of the poem. They first escape the machinations of the treacherous Hardré while in the service of Charlemagne, whose niece is given in marriage to Amis. Bellicent, the Emperor's daughter, loves Amiles, who is thereby brought into great peril, but he is rescued by Amis and obtains the princess. Amis, however, in fighting in place of his friend, has had to perjure himself. For this he is punished with leprosy, of which at last he is cured by the blood of Amiles's two sons, voluntarily sacrificed by their father. These then are miraculously restored to life.

AM'ISH CHURCH, The. See Mennonites.

AMISH CHURCH, The Old. See Mennonites.

AMISTAD (ä'mā'stäᴅ') **CASE, The.** A case before the United States Supreme Court involving the legal status of kidnapped negroes. In 1839 some slaves recently kidnapped from Africa, who were being carried from Havana to Puerto Príncipe, Cuba, in the Spanish schooner *Amistad,* killed two of the crew, the others escaping, and ordered two whites, their owners, whose lives they spared, to steer the vessel to Africa. The latter steered north instead, and in August the vessel was captured off Long Island by a United States warship. President Van Buren wished to surrender the negroes to the Spanish Government, in accordance with the treaty of 1795, as "property rescued from pirates"; but the Supreme Court finally decided (in March, 1841) that the blacks, having been originally kidnapped, were by international law, which then prohibited the slave trade, free men. The case was argued before the Supreme Court with great ability by John Quincy Adams, and aroused much excitement throughout the country, especially among the radical abolitionists, who advocated violent measures to secure the release of the negroes. Consult: Peters, *Reports of United States Supreme Court XV.* (Washington, 1828-43); Barber, *History of the Amistad Captives,* and an interesting article in Volume XXII (N.S.) of *The New England Magazine* (Boston, 1900).

AMITE, à-mēt'. A town and parish seat of Tangipahoa Parish, La., about 70 miles north by west of New Orleans, on the Illinois Central Railroad, and on the Tangipahoa River (Map: Louisiana, E 3). It is the centre of a prosperous agricultural community. Pop., 1890, 1510; 1900, 1547.

AM'ITO'SIS (Gk. ἀ, *a,* priv. + μίτος, *mitos,* a thread of the warp). A division (rare) of the animal or plant cell by simple constriction without the formation of nuclear figures. See Cell; Mitosis.

AM'ITYVILLE. A village in Suffolk Co., N. Y., 32 miles east of New York City, on the Long Island Railroad (Map: New York, G 5). It is near the southern shore of Long Island, and the excellent bathing, boating, and fishing facilities make it a popular summer resort and place of residence. Pop., 1890, 2293; 1900, 2038; 1905, 2429.

AM'LET, Dick, or Richard. In Vanbrugh's play, *The Confederacy* (q.v.), the dissipated son of a vulgar old woman, who is proud of him and gives him money with which to play the fine gentleman. His breeding betrays itself, however, and he marries the daughter of Grife the Scrivener.

AM'LETH, or Hamleth. Prince of Jutland, supposed to have lived in the second century B.C. According to Saxo Grammaticus, he was the son of Horvendill and Gerutha; and after the murder of his father by his uncle Fengo, who married Gerutha, he feigned himself a fool to save his own life. Saxo relates a number of little things regarding Amleth, which are a curious medley of sharp and lively observation, and apparent madness. We are told that, on one occasion, when he visited his mother, suspecting that he was watched, he commenced to crow like a cock and dance idiotically about the apartment, until he discovered, hidden in a heap of straw, a spy in the person of one of Fengo's courtiers, whom he immediately stabbed; he then so terrified his mother by his reproaches, that she promised to aid him in his intended revenge on his father's murderer, and, according to the old chronicler, really did so. Scandinavian traditions confirm the existence of a prince of this name. In the vicinity of Elsinore is shown a suspiciously modern-looking pile of stones, which bears the name of Hamlet's grave. Saxo himself does not mention the manner or circumstances of Amleth's death; but the French translator says that he was murdered at a banquet. Most of the recent historians of Denmark consider the history of Amleth fabulous. As the ultimate source of Shakespeare's tragedy of *Hamlet,* it possesses a perennial interest for all the civilized world. There are two Hamlet sagas in Icelandic, one of which, the romantic *Ambales Saga,* has been edited and translated, with an introductory essay, by I. Gollancz (1898).

AM'LWCH, ăm'lụk. A seaport town of Anglesey, North Wales, on the northern coast of the island, 14 miles northwest of Beaumaris (Map: Wales, B 3). It is a busy but rather dirty town, deriving its importance and wealth almost entirely from the rich Parys and Mona copper mines in its vicinity. Copper-smelting is carried on in Amlwch, and a harbor has been formed by excavation out of the solid slate rock, at the expense of the mining companies, capable of receiving vessels of 600 tons. Pop., 1891, 5400; 1901, 5300.

AM'MAN. See Rabbah.

AM'MAN, Johann Konrad (1669-1724). A Swiss physician, and one of the earliest writers on the instruction of the deaf and dumb. In his work, *Surdus Loquens* (1692), he describes the process employed by him in teaching, which was principally by fixing the attention of the pupils on the motions of his lips and larynx while he spoke, and inducing them to imitate him until they could utter distinct words. He practiced in Holland.

AM'MAN, Jost, or Justus (1539-91). An engraver and designer of great productiveness, many of whose works are in the Berlin collection of engravings. He was born in Zürich and after 1560 lived at Nuremberg. He began a series of copperplate portraits of the kings of France (published 1576), and made many woodcuts for the Bible. His drawing is correct and spirited, and his costumes are minutely accurate.

AMMANATI, äm'mȧ-nä'tē, Bartolommeo (1511-92). An Italian architect and sculptor, born at Settignano; one of the foremost artists of the Late Renaissance or Barocco, at first a pupil of Baccio Bandinelli, and afterward of Sansovino, at Venice, whom he assisted in connection with the Library of St. Mark. On his return to Florence he came under the influence of Michelangelo's Medici Chapel sculptures. He went to Rome and collaborated with Vignola at the Villa of Pope Julius, under Pope Paul III. He returned to Florence in 1557, became architect of Cosmo de' Medici, and devoted himself thenceforth to the beautifying of his native city. His Santa Trinità Bridge, several fountains and small private palaces (Pucci, Giugni), are successful; but his great courts of the Pitti Palace and Santo Spirito are in bad taste. He afterward redeemed himself in the simpler court of the Collegio Romano at Rome (1582), and in the Ruspoli Palace (1586).

AM'MEN, Daniel (1820-98). An American naval officer. He was born in Brown Co., Ohio, entered the naval service as midshipman in 1836, and by successive promotions rose to the rank of rear-admiral in 1877. In 1861-62, and again in 1863-64, he served in Admiral Dupont's blockading squadron, and as commander of the gunboat *Seneca* participated in the reduction of Port Royal (November 7, 1861), and took command of the forts after their surrender. He commanded the monitor *Patapsco* before Fort Macallister (March 3, 1863), and before Fort Sumter (April 7, 1863); and in the two attacks on Fort Fisher (December, 1864, and January, 1865), was in command of the *Mohican*. He served as chief of the Bureau of Yards and Docks from 1869 to 1871, and of the Bureau of Navigation from 1871 to 1878, when he retired to private life. He designed the "Ammen life raft" and the ram *Katahdin*, and wrote *The American Inter-Oceanic Ship Canal Question* (1880); *The Atlantic Coast* (1883), a discriminating account, from the standpoint of a naval specialist, of the operations of the Federal navy along the Atlantic coast during the Civil War; *Country Homes and Their Improvement;* and *The Old Navy and the New* (1891).

AMMENHAUSEN, äm'men-hou'zen, Konrad von. A German poet of the fourteenth century. He traveled extensively, became a monk at Stein, and wrote a long, rhymed poem on the game of chess. For much of his material he drew upon the Latin work of Jacobus de Cessolis. The poem is valuable for the anecdotes of the Middle Ages which it preserves, and still more for extended references to contemporaneous history.

AMMERGAU (ăm'mĕr-gou) **MYSTERY.** See Passion Play.

AM'METER, or **AMPERE'METER** (*ampère* + Gk. *μέτρον, metron,* measure). An instrument which is used to measure the intensity of an electric current, and which indicates this quantity directly in amperes (q.v.). Ammeters are constructed in numerous forms, which are based for the most part on the galvanometer (q.v.), on the intensity of attraction for soft iron exerted by a hollow coil of wire carrying a current, or on the electro-dynamometer. As the galvanometer is used to detect and measure minute currents, so the ammeter is employed in testing and engineering to indicate large currents, and to enable an observer to read directly in amperes the current flowing at any instant in a circuit. The best form of ammeter is the Weston instrument, made in the United States, and used all over the world. It consists of a voltmeter (q.v.) or portable galvanometer, whose movable coil is connected in parallel with a low resistance formed by one or more copper wires. As the current in a circuit depends upon the fall in potential across a constant resistance (in this case the copper wire), the operation of the instrument will readily be seen. Numerous other forms of ammeters are constructed, the simplest of which consist of a coil of wire through which the current passes, inclosing a soft iron core suspended by a spring. The amount that this core is attracted is indicated by a pointer on a scale, which can be made regular by constructing the core of suitable shape. In other ammeters a magnetic needle is placed between the poles of a strong permanent magnet, and is surrounded by coils through which the current passes. This current in passing deflects the needle by an amount depending upon its intensity. The dynamometer or some modification of it, is often used to measure alternating currents, and consists of two coils, one of which is free to revolve against the action of a spring. When the current passes through the two coils, which are normally at right angles, there is a tendency for the movable coil to take a position parallel to the other, and the amount of motion depends upon the intensity of the current.

AM'MIA'NUS MAR'CELLI'NUS. The last Latin historian of the Roman Empire. He flourished in the closing years of the fourth century, and wrote a history of Rome from the accession of Nerva (96) to the death of Valens (378), designed as a continuation of the histories of Tacitus. The work when complete was in thirty-one books, of which only eighteen (14-31) are extant, covering the last twenty-five years of contemporaneous history (353-378). Ammianus Marcellinus was himself a Greek, born at Antioch; but he had served for years in the army, and had risen to rank in the Eastern and Gothic campaigns before he settled down in Rome to a quiet and studious life. His book is of great importance as the conscientious work of an experienced man; but the Latin is rude and the style is heavy and dull. The account of the events of Julian's reign is especially valuable. Best edition by Gardthausen (Leipzig, 1575); English translation by C. D. Yonge, in Bohn's *Classical Library* (London, 1862).

AMMIRATO, äm'mê-rä'tô, SCIPIONE (1531-1601). An Italian historian of some merit. He was born in Lecce, in the kingdom of Naples, and after living in Venice, Rome, and Naples, settled at Florence. In Venice he aided in editing an edition of Ariosto. His reputation, however, rests mainly upon his *Istorie fiorentine,* which in 1570 he was commissioned to write by the Grand Duke Cosimo I., and which covers the history of Tuscany from the earliest times down to 1574. It shows distinct ability and historical acumen, and is based upon original documents and other authentic sources. First complete edition, Florence, 1641-47; best modern reprint, Turin, 1859.

AM'MON. An Egyptian deity. His name (Egyptian *Amon*, later *Amûn*) was explained by the priests as meaning "the hidden," or "mysterious;" but this etymology is not reliable. Originally Ammon was merely the local god of Thebes; but after the Theban dynasties became rulers of all Egypt (beginning with the Eighteenth Dynasty, about 1600 B.C.), he became the official head of the pantheon and national deity of Egypt. His worship spread throughout Ethiopia and Libya, and he had a famous oracle in the Libyan Desert. The Greeks identified him with their supreme god Zeus, and named Thebes, his original seat of worship, Diospolis. In the Old Testament the city is called No-Amon, "The City of Ammon."

Although not originally a solar divinity, later theological schools ascribed a solar character to this god, and he was called Ammon-Rê, i.e., "Ammon the Sun." In his statues, Ammon is generally represented in human form, with skin of a bluish tint, and wearing a peculiar headdress, from which rise two immense feathers, while a long and narrow band hangs down behind. He often appears in the form of his sacred animal, the ram, or as a ram with a man's head. Among the Greeks and Romans, the Libyan type, with a human head bearing a ram's horns, became popular. For illustration, see EGYPT.

AMMON, OTTO (1842—). A German anthropologist and editor. He was born at Karlsruhe, and was educated as a civil engineer, which profession he followed from 1863 to 1868. He then became a publisher and editor, but in 1883 began to devote himself to literary work, and afterward made several important contributions to sociological and anthropological literature. He was the discoverer of the so-called "Ammon's law," that the Teutonic race betrays almost everywhere a marked tendency toward city life, which he has demonstrated in a series of interesting measurements of the physical characteristics, especially of the head, of thousands of conscripts in the Baden army, showing radical differences between the form of the head in city and country, and between the upper and lower classes in the larger towns. His chief works are: *Die natürliche Auslese beim Menschen* (Jena, 1893), *Die Gesellschaftsordnung und ihre natürlichen Grundlagen* (second edition, Jena, 1896), and important articles as follows: "Die Geschichte einer Idee," *Rundschau* (Berlin, 1896), on the physical types of city populations; "Der Abänderungsspielraum," *Naturwissenschaftliche Wochenschrift* (Berlin, 1896); "Die Menschenrassen in Europa," *Rundschau* (Berlin, 1896); "Die Körpergrösse der Wehrpflichtigen in Baden, 1840-64" (Karlsruhe, 1849); "Anthropologische Untersuchungen der Wehrpflichtigen in Baden" (1890).

AMMONIA. See ANTIDOTES.

AMMO'NIA (Gk. *ἀμμωνιακόν, ammōniakon,* rock-salt), NH_3. A colorless, pungent, gaseous compound of nitrogen and hydrogen. It was known to the ancients as volatile alkali, and is said to have been called *vehement odor* by Pliny. Its name is believed to be derived from Zeus Ammon, near whose temple in Libya, Upper Africa, it was first produced by burning camels' dung. Others derive it from Ammonia, a Cyrenaic territory. In 1774 Priestley obtained it by boiling its aqueous solution and collecting the gas, which he termed *alkaline air*, over the mercurial pneumatic trough. Scheele showed that it contained nitrogen, and Berthollet, in 1785, demonstrated its composition. Free ammonia does not occur in nature, but its salts are found in the atmosphere and in rain-water, in mineral and sea waters, in most plants, and as a product of the decay of nitrogenous organic bodies.

It may be made by heating ammonium chloride with lime. The principal commercial source of ammonia is from the destructive distillation of coal in gas making. In the distillation of coal in a retort, there is obtained, first, illuminating gas, and, secondly, a liquor which contains ammonia. Allowing this liquid to settle, the aqueous portion separates, from which free ammonia is first expelled by means of steam, after which the liquor is treated with lime and further steam to expel the fixed ammonia. The steam, ammonia, and other gases are passed through strong sulphuric acid in lead tanks, and the crystals of ammonium sulphate which then form are removed from time to time by means of ladles, while the free ammonia is collected in water yielding aqueous ammonia or hartshorn, a transparent, colorless, and strongly alkaline liquid with an acrid, caustic taste and pungent odor. When exposed to the air, it loses ammonia, and when reduced to minus 40° C. it freezes.

Liquid ammonia has been used for motive power, and its evaporation is the basis for the Carré and Linde processes for the production of artificial cold. It is also used in pharmacy, dyeing, calico printing, and in the preparation of coloring matters, and many chemicals.

Ammonium sulphate, which is a white crystalline compound, is largely used both alone and in mixtures as an artificial fertilizer; it is also used in the manufacture of alum, and in the preparation of other ammonium salts. Ammonium chloride, called also *sal ammoniac*, is used in pharmacy, in dyeing, and as a convenient source of ammonia. Ammonium carbonate, called also *sal volatile,* is used for scouring wool, for dyeing, and as a baking powder. Consult: Arnold, *Ammonia and Ammonia Compounds* (London, 1889); and Lunge, *Coal Tar* (London, 1882).

AMMO'NIAC (Lat. *ammoniacum*, Gk. *ἀμμωνιακόν, ammōniakon*, gum-ammoniac), or GUM

AMMONIAC. A gum-resin, used medicinally in certain plasters. It is obtained from the Dorema ammoniacum, an umbelliferous plant found in Persia and Turkestan. The gum is made by drying the milky juice of the plant. It occurs in commerce either in tears, or in masses formed of them, but mixed with impurities. It is whitish, becoming yellow by exposure to the atmosphere, is softened by the heat of the hand, and has a peculiar heavy smell and a bitter taste.

AM′MONI′ACAL COP′PER CAR′BONATE. See FUNGICIDES.

AM′MONITE (Derived from *ammonia*). A trade name of a product rich in nitrogen (thirteen to fourteen per cent.), obtained largely from rendering establishments where different portions of dead animals are subjected to treatment—usually drying and extracting the fat by means of steam. The product is also obtained in considerable quantities from beef-extract factories. It is a high-grade, nitrogenous fertilizer, practically identical with the "dried meat or meal," "animal matter," or "azotin," found on the market as a fertilizer. See article FERTILIZERS.

AMMONITES. A people allied to the Moabites, and also (though in a minor degree) to the Hebrews, whose settlements were on the edge of the Syrian Desert. According to Genesis (xix : 38) they were descendants of Ben-Ammi, the son of Lot, and while this account is fanciful, there is no reason to doubt the relationship implied between Ammonites and Moabites. The Ammonites inhabited the country east of the Jordan, between the rivers Arnon and Jabbok, i.e., the desert country east of Gad. Their chief city was Rabbath Ammon (Deuteronomy iii : 11; Ezekiel xxi : 20), known as Philadelphia in the Greek occupation. The relations between the Ammonites and the Hebrews were almost continuously hostile. Jephthah defeated them with great slaughter (Judges xi : 4-33; xii : 28 may be a later interpolation); they were also overcome by Saul (I. Samuel xi : 1-11), and by David (II. Samuel xii : 26-31). After the kingdom was divided, the Ammonites attacked Gilead, perhaps together with the Assyrians (II. Kings xv : 29; I. Chronicles v : 26), for which they are denounced by the prophets Amos i : 13), Zephaniah (xxviii, xxix), Jeremiah (xlix : 1-7), and Ezekiel (xxi : 28-32). In the days of Jehoshaphat, the Ammonites made an abortive attempt to attack Judah (II. Chronicles xx : 1-30), and later they were defeated by King Jotham (II. Chronicles xxvii : 5). After the captivity they recommenced their feuds with the Jews (Nehemiah iv : 1-15), but in the days of Judas Maccabæus the Ammonites, together with their Syrian allies, were thoroughly routed by the Jews (I. Maccabeus v : 6). Justin Martyr affirms that in his day (about 150 A.D.) the Ammonites were still numerous. The chief deity worshipped by the Ammonites was Milcom, which signifies "king" (I. Kings xi : 5, 7-33), who bore the same relation to his subjects as Chemosh did to the Moabites and Yahweh to the Hebrews. He was the natural protector to whom the people looked for succor in distress. Of the rites of the Ammonites we know nothing beyond the prejudiced references in the writings of the Hebrew prophets, but the supposition seems reasonable that the worship was similar to that of the Moabites as well as to that of the Hebrews in the early stages of their history. The Ammonitish language, likewise, was practically identical with Moabitish and ancient Hebrew, the differences between them being merely of a dialectical order. See the commentaries on Genesis xix : 38, Dillmann, Delitzsch, Gunkel, and Holzinger.

AMMONITES, ăm′ô-nī′tēz. A generic name given by Lamarck and L. von Buch to a group of tetrabranchiate cephalopod shells found in the Mesozoic rocks of Europe. A still earlier name applied to them by the alchemists and others of the Middle Ages was Cornu Ammonis, from a fancied resemblance to the horns of Zeus Ammon. The term Ammonites has, as a generic name, fallen into disuse, for more recent researches have shown that Von Buch's name included a large array of species that present characters not only of a generic but also of family rank. The name is, however, still used in a loose way to distinguish those Mesozoic cephalopods, with complicated suture lines, from the Palæozoic Goniatites with more simple sutures. Von Buch's three genera, Ammonites, Ceratites, and Goniatites, with their numerous species, have been broken up into a host of new generic terms, about fifty in number, and these latter have been grouped into about ninety families, all of which are included in the order Ammonoidea. For the structure of the shell, the distribution of the species, and the geological history of the group, see CEPHALOPODA.

AMMO′NIUM (From *ammonia*), NH_4. A chemical radicle composed of one atom of nitrogen and four atoms of hydrogen. This radicle or atomic group, acts like the monovalent elements, sodium and potassium, and is contained in ammoniacal salts. An amalgam, too, has been obtained in which it exists in direct combination with mercury. Ammonium amalgam is a pasty, lustrous, metal-like substance formed by passing an electric current through ammonium chloride in contact with mercury. It is an unstable body, which readily decomposes, giving off ammonia and hydrogen.

AMMO′NIUM. See SIWAH.

AMMO′NIUS (Gk. Ἀμμώνιος, *Ammōnios*). An Alexandrian philosopher of the third century A.D., surnamed Saccas (sack-carrier), because, as it is said, he had been a porter in his youth. He was of Christian parentage, but according to his most eminent pupil, Plotinus, his studies led him to abandon Christianity for the old Greek religion; this is denied, however, by Eusebius and St. Jerome. Longinus says that as a philosopher he surpassed all his contemporaries; his teaching was directed chiefly toward harmonizing the doctrines of Plato and Aristotle, and through his disciples he became the founder of the Neo-Platonic school of philosophy. Among his pupils were Origen, the Neo-Platonist, Origen the Christian, Longinus, Herennius, Theodosius, Antoninus, and Plotinus. Ammonius left no writings, but his esoteric teachings were spread by Origen and Herennius, and especially by Plotinus.

Ammonius was the name of several other learned men in the later periods of Greek history: Ammonius, a Peripatetic philosopher of the first century, the teacher of Plutarch; Ammonius, a Christian philosopher at Alexandria in the third century, who wrote a work on the agreement of the teachings of Moses and Jesus, and composed a harmony of the Gospels; Ammonius, son of Hermeas, a Peripatetic philosopher of the fifth century, disciple of Proclus and author of commentaries on Aristotle; Ammonius, the famous surgeon of Alexandria, who lived in the latter half of the first century B.C; Ammonius, the grammarian, pupil of Aristarchus, and his successor as head of the Alexandrian School.

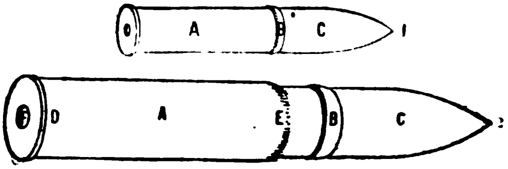
AM'MONOID'EA. An order of tetrabranchiate cephalopods, equivalent in rank to the Nautiloidea. It contains more than five thousand species, all of which are extinct and found in a fossil state in marine rocks of Devonian and Carboniferous, and abundantly in those of Mesozoic age of all parts of the world. The form of the animal in this order is unknown; but from the structure of the shell, it is supposed to have a form like that of its only living ally, the nautilus, though of a more delicate construction, and to have been a crawler instead of a swimmer. The shell is coiled in a single plane, with its apex in the centre of the coil, and it is usually compressed into a discoid. This discoid form is in some phylogerontic or senile types of Mesozoic Age changed to a turreted, or irregular, or straight shell. The five thousand species of the order are grouped under about five hundred genera and some ninety-eight families, according, chiefly, to the form and mode of development of the so-called suture lines, which are the lines of union of the internal septal walls with the inner wall of the shell. The order is of peculiar interest, in that, of all groups of animals, it furnishes the finest illustrations of evolution, and the laws of growth and decline, of ontogeny and phylogeny; in other words, of bioplastology. For more particular information and illustrations, see CEPHALOPODA.

AM'MONOO'SUC, LOWER. A river rising in the White Mountains, New Hampshire, and flowing through Coos and Grafton counties (Map: New Hampshire, G 5). It is 90 miles long, drains an area of nearly 400 square miles, and furnishes extensive water power. It flows into the Connecticut River opposite Wells River, Vermont.

AMMONOOSUC, UPPER. A river, 40 miles long, rising in the Randolph range of the White Mountains, and draining an area of 252 square miles of Coos County, New Hampshire (Map: New Hampshire, J 3). It flows into the Connecticut below Groveton.

AMMOPH'ILA (Gk. ἄμμος, *ammos*, sand + φίλος, *philos*, friend, loving). A genus of grasses, closely allied to Arundo. (See REED.) It is distinguished by a spike-like panicle, and by the character of the glumes, which are nearly equal, keeled, longer than the paleæ of the single floret, and surrounded at the base by a tuft of hairs. Ammophila arenaria or Ammophila arundinacea, formerly called Arundo arenaria—a grass about two to three feet high, with rigid bluish leaves, the edges of which are rolled in, and creeping rootstocks—is frequent on sandy shores of Great Britain and the Continent of Europe. It is sometimes called beach grass, sea reed, or sand reed, and sometimes mat grass, because the culms are wrought into foot-mats, coverings for stairs, etc. It is also called *marram*, by which name it is designated in laws both English and Scottish, by which the destruction of it was prohibited under severe penalties, because of its great utility in fixing the shifting sand. In Holland and in Norfolk, as well as in the United States, it is extensively employed—along with the Sea lyme grass (q.v.)—in preserving the banks of sand which prevent the inroads of the sea. It is of little value as food for cattle, although they eat the very young leaves. The fibre has been used instead of flax, but is too short. Beach grass has been used in the manufacture of paper of coarse quality.

AM'MUNI'TION (Fr. *amunition*, probably by wrong division of *la munition* into *l'amunition;* from Lat. *munire*, to fortify, defend). A term which embraces all the ordnance stores used in the actual firing of guns of every sort and calibre, and which includes gunpowder, projectiles, primers, and their accessories. When the powder, projectile, and primer are so combined in a single piece as to be ready for firing as soon as placed in the gun, the packages so formed are called *fixed ammunition;* the term is also extended to ammunition for large guns in which the powder is inclosed in a primed metallic case, but loaded separately from the projectile. In small arms the ammunition is invariably of the fixed type. For heavy guns the ammunition is almost universally fixed for calibres of less than four inches. Above this, the practice is not uniform in all countries or in all classes of guns. In the United States naval guns of 1899 and later models, fixed ammunition is used for calibres not exceeding four inches; guns of five-inch calibre, of models antedating 1899, are also supplied with it; six-inch guns, except those of 1899 and later models, have the powder charge put up in primed brass cartridge cases, but the projectile is separately loaded. In other services, army and navy, the rule was, and is, about the same. In the new United States Navy guns (model of 1899), fixed ammunition is used for guns of four-inch calibre and less. No cartridge cases are used for the larger calibres. A new form of lock, which automatically ejects the primer, assists to make the loading with powder in bags quite as rapid as if it were incased in metal. The metallic cartridge cases used for fixed ammunition are now generally made of hard drawn brass of the best quality, stamped from sheets or plates of varying thickness, depending upon the calibre of the gun for which they are designed. The circular disk cut from the sheet or plate is first given the form of a shallow cup and then drawn out



FIXED AMMUNITION—UNITED STATES NAVY.

1. One-pounder. 2. Six-pounder, three inch and four inch.

A. Brass Cartridge Case, bottle-necked at E.
B. Rotating Band (copper).
C. Projectile.
D. Base of Cartridge Case.
E. Bottle-neck of Cartridge Case.
F. Primer.

and pressed into finished shape. The cases usually have a rim around the base, but some have a groove, called a *cannelure,* sunk into and surrounding the base; the chief use of both rim and cannelure is to enable the extractor to take hold of and extract the empty case after firing; but the rim also assists to hold the case in its proper position in the gun. The high velocity given the projectile in a modern gun entails the use of a relatively large charge of powder; to hold this, and to avoid undue length of case, which involves unnecessary weight and introduces difficulties in connection with vibrations and pressures, the case is increased in diameter over the powder and drawn down to form a bottle-neck where it grips the projectile. No paper cases are used for military or naval arms, but the cases for the ammunition of breech-loading shot-guns have the cylindrical portion of cardboard or *papier-maché,* the base being of brass formed in the manner already described.

Gunpowder (see EXPLOSIVES and GUNPOWDER), the propelling force in all military weapons in general service (except pneumatic guns, which have a very limited use and are not generally approved for any purpose), is put up, for guns of large calibre, in bags made of some sort of cloth, usually serge. For convenience of handling, the charges are divided into sections when the weight of the full charge exceeds one hundred pounds. Powder charges, when in bags, are stowed in water-tight copper tanks in compartments or buildings called magazines; on shipboard, magazines are placed below the water line, near the bottom of the ship, and as far away as practicable from the heat of boilers and engines. In fortifications the magazines for war service are below ground or behind ample protections. Fixed ammunition is stored in rooms similar to magazines, as are also projectiles (q.v.). Powder charges, whether in metallic cases or in bags, are ignited by primers; these are of four types: percussion, friction, electric, and combination (percussion and electric). Percussion primers resemble miniature fixed ammunition; those used in the United States Navy are about an inch long, one-fifth of an inch in diameter in the body, and enlarged considerably at the base; they contain seven grains of fine powder in the body, and a primer cap in the head, which will ignite when struck by the firing pin of the gun lock. Friction primers are of the same shape and size, but are ignited by the friction caused by drawing a serrated strip of metal through the fulminate in the primer head. Their use in the United States Navy has been discontinued, but they are still in some favor abroad. Electric primers differ from those already mentioned in being ignited by an electric spark instead of by friction or percussion. Single and double wire systems are employed, but only the former is used in the United States Navy; in guns which do not use fixed ammunition the current, furnished by a dry battery, or the dynamo, passes through a single insulated copper wire into the primer; there it encounters resistance in the shape of a bridge of platinum wire, and thence escapes through the metal of the primer to the gun and so to earth; in passing through the platinum bridge it heats the latter white hot and thus causes ignition. In guns using fixed ammunition, the electric primer is screwed or pressed into the base of the powder case; the current enters the primer through the electric primer connection, which is similar to the percussion firing pin, but is insulated in order to carry the current. The combination primer has been very extensively used, but at present the general sentiment is against it, as it is dangerous, if not carefully used. It was arranged for ignition either by electricity or by percussion. It was much larger than the older primers, being about two inches long and about as large around as a lead pencil.

Effective ammunition is one of the most important factors of modern warfare, and the one great factor in determining prevailing tactics, methods of defense, and equipment of men and materials. Every improvement in rapidity of fire of weapons increases the anxiety about the supply of ammunition in the field; nevertheless, it must be remembered that, although separate battalions or batteries have on occasion been without ammunition, the troops as a whole have never suffered from this want. The soldier carries a considerable number of rounds on his person, and at the very opening of a battle the company ammunition wagons are available; when they are exhausted, they go to the nearest ammunition column, replenish, and return as quickly as possible. The field artillery uses its limber ammunition only when no other is available, that of the caissons being used first; the empty caissons being replaced by others from the second échelon of the battery, and the latter obtaining further supplies from the ammunition columns.

The question of ammunition was one of the subjects of the Peace Congress held at The Hague in the summer of 1899, and strong recommendations were made to discountenance the use of explosive or expanding bullets. The English in the Sudan, and in smaller Indian punitive expeditions, found that the smallness, shape, and velocity of a modern rifle bullet had not a sufficiently deterring effect on the charging masses of tribesmen, and frequently used the so-called dum-dum bullet, which is made of softer metal and expands or contracts. During the Boer War dum-dum and explosive cartridges were frequently found after the various battles, each side charging the other with having used them. In the Spanish-American War of 1898-99 the small, clean-cut wounds caused by the Krag-Jörgensen (United States) and Mauser (Spanish) bullets were found fatal only in a small percentage of cases. Instances were frequent where men continued to fight for some time after being hit.

In England, and Europe generally, all government-made ammunition is manufactured at the government arsenals. See ARSENAL.

The word ammunition is still retained in the English services in its early English form, as pertaining to certain forms of military supplies; ammunition shoes, ammunition socks, ammunition bread, ammunition shirts, etc., as distinct from the same articles supplied from purely civil sources. See PROJECTILE; FUZE; PRIMER; CARTRIDGE; ORDNANCE; ARTILLERY, etc.

AMMUNITION CHESTS. Boxes containing ammunition, packed so as to be fitted for transport by either elephant, camel, bullock, pack-horse or mule; or in the case of horse and field artillery so arranged that the gunners may utilize them for seats or pack them in caissons.

AMMUNITION WAG'ON. A specially built wagon for the safe and speedy transport of ammunition. The general use of rapid-fire guns has made the question of suitable wagons, capable of carrying the tremendous quantities of ammunition demanded by modern arms and warfare, one of the most important features of a campaign. Lord Roberts, the British commander-in-chief in the Boer War, specially employed and strongly recommended wagons built in the United States and used generally in the United States Army. The important features of such wagons are great strength, easy draught, great flexibility, and adjusted balance. They must also be so arranged that the shells and fuses are held firmly in place.

AMNESIA, loss of memory of words or occurrences. Forgetfulness of the name of an object is called verbal amnesia. If able to write the name or nearly articulate it (as to say *foos* for 'foot'), the condition is called amnesic aphasia. Senile changes, injuries or tumors of the brain, some insanities and even fatigue or the exhaustion of disease may cause amnesia. See APHASIA.

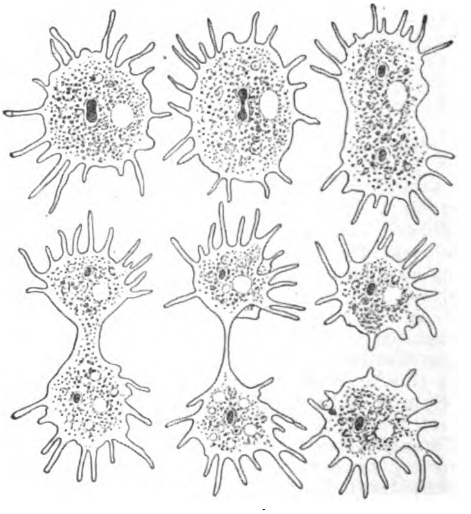
AM'NESTY (Gk. ἀμνηστία, *amnēstia*, forgetfulness, from ἀ, *a*, priv. + μνᾶσθαι, *mnasthai*, to remember). An act of State granting oblivion for past offenses, and generally employed where pardon (q.v.) is extended to whole classes or communities instead of to individuals before trial and conviction. The President may grant amnesty by a general proclamation for offenses against the United States, except in cases of impeachment; and the Supreme Court has held that Congress also may pass acts of general amnesty. (Brown vs. Walker, 161 U. S., 591 [1895].)

AM'NION (Gk. ἀμνίον). The membrane which immediately invests the embryo, appearing very early in the development of the latter, and adhering closely to it. As gestation proceeds, this membrane secretes from its inner surface a fluid which separates it from the fœtus. This fluid, the *liquor amnii*, supports and at the same time gives free movement to the fœtus, preserves it from injury, and maintains around it an equable temperature, and later, during labor, becomes, with its inclosing membranes, an important dilator of the genital canal. See EMBRYOLOGY, and CAUL.

AM'NIO'TA. See EMBRYOLOGY.

AMŒ'BA (Neo-Lat.; Gk. ἀμοιβή, *amoibē*, change, alternation). A microscopic animalcule, classified among the lowest Protozoa, which inhabits fresh water or occasionally moist earth. It appears in water under great magnification as a clear, translucent, highly refracting body. It is made up of a substance that does not mix with water, is viscid like glue, and has a specific gravity a little greater than water, namely about 1.015. Under the highest power of the microscope, particularly after death, the body is seen not to be perfectly homogeneous, but to be made up of films inclosing water-filled spaces. This structure may be imitated by making a fine mixture of oil and potassium carbonate, and letting it stand in water. The potassium carbonate is hygroscopic, and eventually an emulsion is produced in which the oil stands to the water in the same relation that the protoplasmic films do to the water spaces. The cytoplasm is not all of the same kind. Near the centre is a specialized portion known as the nucleus, the protoplasm outside of which is called cytoplasm. Between nucleus and cytoplasm a constant interchange of material is taking place in the living cell, and the two parts are interdependent.

A living amœba under appropriate conditions exhibits a continual movement of the protoplasm. The very structure favors a constant movement, as witness the artificial emulsion, whose outline is constantly changing. In amœba processes (pseudopodia) are thrust out at certain points of the body, and others behind them are retracted, and thus a change occurs in the centre of the mass and locomotion is effected. Amœba is irritable, i.e., it is affected in a definite manner by external conditions; it "responds" to them by moving with reference to them. Without a stimulus there would probably be no movement at all. If the stimulus comes upon the organism from one side, it may move toward or from that side. Thus the amœba moves from the point of contact of a needle or from the source of light, or it moves so as to keep in water of a medium temperature. Thus we see that protoplasm early had the capacity of appreciating external conditions and moving with reference to them.



AMŒBA.

Beginning at the upper left-hand figure, the successive drawings show the progress of a division of an amœba through its nucleus into two.

The amœba is, by its movements, constantly expending energy. Also, its plasma is undergoing constant destruction and must be reformed. Food here serves two purposes. (1) It serves as fuel. (2) It forms new protoplasm. There is no proper oral aperture, and the food is merely taken into the interior of the body by a process of intussusception—any portion of the surface being chosen for this purpose, and acting as an extemporaneous mouth. Sometimes the ingestion of food takes place chiefly at the posterior end of the body. When the particle of food has been received into the body, the aperture by which it was admitted again closes up, and the discharge of solid excreta is effected in an exactly similar but reverse manner. Food-stuffs that are ingested become dissolved (digested) and penetrate the plasm films. Here they are burned (oxidized) and carbon dioxide, water, urea, and other substances are produced. These get back into the water spaces and are finally thrown out with the "contractile vacuole." This process is excretion. But in the plasma film, where the food-stuff was burned, there is an increase of temperature. This heat is used in part in chemical work—in the building up of new living molecules from food stuffs. Here, then, is a great chemical laboratory in the protoplasm.

"The 'contractile vesicles' are cavities within the endosarc, of which ordinarily only one is present in the same individual, though there may be two or more. In position, the contractile vesicle, or 'pulsating vacuole,' as it is often called, is usually placed toward the hinder end of the body, as is also the nucleus."

Reproduction takes place by simple division, each amœba, as it reaches maximum size, splitting in two, as shown in the illustration. See Cell, and Protozoa.

AM'ŒBE'AN VERS'ES (Gk. *ἀμοιβαῖος*, *amoibaios*, alternate). A species of pastoral poetry in which two persons answer each other alternately, as in some of the *Idyls* of Theocritus and the *Eclogues* of Vergil.

AMOL, ȧ-mōl'. A Persian town, in the province of Mazanderan, situated on the River Heraz, a short distance from its fall into the Caspian Sea (Map: Persia, D 3). It contains a fine bazaar and a number of old tombs, including that of Mir Bursuk, who died in Amol in 1378, and whose memory is held in great reverence by the natives. Pop., about 10,000.

AMOLE, ȧ-mō'lȧ. The Mexican name for soapwort (q.v.).

AMO'MUM (Lat. Gk. *ἄμωμον*, *amōmon*, an Indian spice-plant). A genus of Zingiberaceæ, to which belongs the plant yielding Cardamom (q.v.) and Grains of Paradise (q.v.). Fruits allied to Amomum are described as Amomocarpum, from Tertiary rocks of Europe.

AM'ON. A king of Judah, from about 639 to 638 B.C., son of Manasseh. After a short reign he fell a victim to a court intrigue. His death was avenged, and his son Josiah succeeded him on the throne. He was buried in the garden of Uzzah.

AMONTONS, ȧ'môɴ'tôɴ', Guillaume (1663-1705). A French physicist and inventor. He devoted himself to physical research, investigating the phenomena of friction and perfecting many instruments used in experimental philosophy. With the aid of the barometer he studied the variations of atmospheric pressure, and by the use of a thermometer of his own invention, discovered independently, though simultaneously with Halley, that the boiling-point of water varies with the external pressure of the atmosphere, and hence with the elevation. He also invented an ingenious method of telegraphic communication, a new hygrometer, etc. He wrote: *Remarques et expériences physiques sur la construction d'une nouvelle clepsydre, sur les baromètres, les thermomètres, et les hygromètres* (1695), besides contributions to the *Mémoires* of the Académie des Sciences.

AM'ORET. In Fletcher's *Faithful Shepherdess* (q.v.), a shepherdess betrothed to Perigot at the "Virtuous Well," and, after many troubles, patiently borne, united to him.

AMORET, or **AM'ORET'TA.** In Spenser's *Faerie Queene*, the twin sister of Belphœbe (q.v.), brought up by Venus and Psyche. She loves Sir Scudamore, but is imprisoned by the enchanter Busirane; in the end, however, she is happily married, appearing as the type of feminine affection.

AMORETTI, ä'mō-rĕt'tē, Carlo (1741-1816). An Italian naturalist and author. He was born near Genoa, and died at Milan. He was a member of the order of St. Augustine, professor of law at the University of Parma, and afterward curator of the Ambrosian Library at Milan. He is remembered chiefly for a good biography of Leonardo da Vinci (1784), and various treatises on natural science, including a study of the natural history and geography of lakes Como, Maggiore, and Lugano, entitled *A Journey from Milan to the Three Lakes* (1794).

AMORGOS, ȧ-môr'gŏs (Gk. *Ἀμοργός*). The most easterly island of the Cyclades, Greece, having an area of 52 square miles, with its greatest length from northeast to southwest. The island is crossed by a mountain range, and yields olive oil, wine, fruit, and grain. Its chief town is Korax, or Chora, on the eastern coast. Amorgos was famous in antiquity for the fine quality of its flax. Population in 1896, 3561. Consult: H. Hauttecœur, "L'Île d'Amorgos," in *Bulletin de la Société royale belge de géographie*, Volume XXIII. (Brussels, 1899); J. Delamarre, "Amorgos," in *La Revue de Philologie*, Volume XXV. (Paris, 1901).

AM'ORITES. The name of a people of Canaan (II. Samuel xxi : 12; Amos ii : 9, 10). The name is known outside of biblical literature, occurring on both the Assyrian and Egyptian inscriptions. The Egyptian documents speak of a people called the Amar. In the Assyrian monuments Nebuchadnezzar I. styles himself the conqueror of the "land of Amurru," while even earlier we know of Amurru from the Tel-el-Amarna tablets. The name was applied originally to the highlands in the northeast and gradually spread southward (Genesis xiv : 7; Deuteronomy i : 7-44) and westward, where it met the term Canaan. From that time on considerable confusion took place in the use of the name. Sometimes the terms coalesce, Amorite being used for the whole of Canaan (II. Samuel xxi: 12 Amos ii: 9, 10); again some tribes are called Amorites in one place and another name in another (Joshua x : 5; Joshua xv : 63). In the narrower sense, the Amorites lived on the eastern side of the Jordan, and at the time of the invasion of the Jews had two kingdoms, under Og and Sishon, respectively. This land the Amorites had held against the Hittites on the north and the Moabites on the south. In two battles the Amorites were defeated and their land annexed to the territory west of the Jordan (Deuteronomy xxxi : 4). Although subdued, they were far from being exterminated, or else the injunction against intermarriage with the Amorites would have been unnecessary. And the injunction further proves their final history. They lived as tributaries among the conquering nation, as in the days of Solomon, and were most likely absorbed.

The meaning of the name has been given in two ways. According to some scholars the root idea is "high," "lofty," "mountaineers," as opposed to the Canaanites, the lowlanders; while according to others the "high" is to be applied not to the locality but to the size of the men. Of the two, the first is preferable, though it should be added that there are strong objections to be urged against the explanation. Consult

Sayce, *Races of the Old Testament* (London, 1891).

AMOROSO, ä'mō-rō'sō (It. amorous). In music, affectionately, tenderly.

AM'OROUS BIG'OT, The. A play by Thomas Shadwell, presented in 1690.

AMOR'PHA. See Indigo.

A'MORY, Blanche. A character in Thackeray's *Pendennis* (q.v.), really named Betsy; an insincere and selfish girl, whose emotions are all shams.

AMORY, Robert (1842—). An American physician. He was born in Boston, and studied medicine at Harvard and later in Paris and in Dublin. In 1869 he was made lecturer at Harvard College on the physiological action of drugs. He was also for some time professor of physiology at the Bowdoin Medical School. Besides a translation from the German of Russ's *Lectures on Physiology* (Boston, 1875), Dr. Amory published a number of interesting papers on the physiological action of various chemical substances. He also wrote a volume on poisons, forming part of Wharton and Stillé's *Medical Jurisprudence*.

AMORY, Thomas (1691?-1788). An Irish author, called the "English Rabelais," and supposed by certain authorities to have been slightly insane. He was the son of Counselor Amory, who was appointed by William III. secretary for the foreign estates in Ireland. His birthplace is not known, but in 1757 he was living in seclusion in Westminster. It is supposed that he sketched portions of his own career in his *Life of John Buncle*, 2 volumes (1756-66). He wrote also *Memoirs Containing the Lives of Several Ladies of Great Britain* (1755). He was married and had one son, Dr. Robert Amory. A sketch of his life appeared in the *Saturday Review*, May 12, 1877.

AMORY, Thomas Coffin (1812-89). An American lawyer and author. He was born in Boston, Mass., and after graduating at Harvard (1830), held various posts in connection with the municipal government of Boston. In addition to official reports and addresses, his publications include the *Life of James Sullivan* (Boston, 1859), *Military Services and Public Life of Major-General John Sullivan* (Boston, 1868), pamphlets on subjects connected with the Revolutionary War, among which was a *Life of Sir Isaac Coffin* (1886), and numerous poems, of which the best known is *William Blaxton, Sole Inhabitant of Boston*.

A'MOS. A Hebrew prophet of the eighth century B.C., author of the biblical book which bears his name. He was a herdsman of Tekoa, in the neighborhood of Bethlehem (Amos i : 1), and also a tender of sycamore trees (Amos vii: 14). He prophesied during the reigns of Uzziah in Judah and Jeroboam II. in Israel (about 760 B.C.). He foretells the doom, first of several surrounding nations, then of Israel itself, on account of the various sins, mainly disloyalty to Yahweh, which had brought the anger of Yahweh upon the kingdom. He closes with a promise of restoration for Israel. The style of Amos is remarkable for its clearness and picturesque vigor, and abounds with images taken from rural and pastoral life. While Amos is the first of the prophets who wrote as well as spoke, the editing of his prophecies belongs to a period long subsequent to the prophet's death. Hence, modern critics have detected in the prophecies numerous additions, insertions, and changes, made by the various hands concerned in giving the series of chapters its present form. For recent discussions of the problems involved, consult: G. A. Smith, "The Twelve Prophets," in *The Expositor's Bible*, Volume I. (New York, 1896-97); and H. G. Mitchell, *Amos* (Boston, 1899).

AMOSKEAG, ăm'ŏs-kĕg'. See Manchester, New Hampshire.

AMOY, ȧ-moi' (the local pronunciation of *Hai-mun*, or Gallery Gate). A Chinese city on an island of the same name, in N. lat. 24° 28', E. long. 118° 4', at the mouth of the Pei-chi or Dragon River, in the province of Fukien (Map: China, E 5). The island of Haimun is 40 miles in circumference. Amoy is the ancient centre of the tea trade. The Portuguese came here in 1644, but were expelled for their cruelty. The English traded here until 1730, when they were ordered to remove to Canton. Nearly all the tea brought to Boston Harbor by the British ships in 1773 was from Amoy, in the neighborhood of which it was grown, and where the pronunciation of *cha* is 'tea.' All the tea now exported to the United States from Amoy is grown in Formosa and sent here for reshipment. Even this trade is being gradually lost since the harbor at Kelung, Formosa, has been deepened, and it is expected that it will be entirely ruined when the harbor improvements at Kelung and Tamsui shall have been completed. The British treaty of 1842 made Amoy one of the five ports opened to foreign commerce, and the treaty of Tien-tsin in 1858 confirmed and extended the privilege. Amoy has long been the centre of flourishing Christian missions in Fukien. In 1882 a British engineer discovered coal and iron within 40 miles of Amoy, in an area of 50 square miles, and within 20 miles of water traffic. The harbor is large, safe, and picturesque. There are three granite docks built by foreigners, an English church and club, and a daily newspaper. One hundred thousand emigrants pass through Amoy every year to Singapore, and about 25 per cent. of those who leave the port do not return. It is estimated that over 2,500,000 of Amoy people were abroad in 1905. Four-fifths of the families have some members abroad, but for whose remittances the distress would be terrible. Pop., 1904, 114,000.

AM'PELIDA'CEÆ. See Vitaceæ.

AMPE'LIUS, Lucius. A Roman writer, who lived between the second and fourth centuries A.D. He was the author of a note-book, *Liber Memorialis*, which contained a condensed and meagre summary of various astronomical, geographical, and historical writings. The *Liber* is too inaccurate for use as a work of reference, but it is valuable as the only ancient work which mentions the celebrated sculptures of Pergamus, discovered in 1878, and now at Berlin. It is usually appended to editions of Florus, and has been edited with notes by Beck (Leipzig, 1826). The best text is that of Wolfflin (Leipzig, 1854).

AM'PELOP'SIS (Gk. ἄμπελος, *ampelos*, vine, + ὄψις, *opsis*, appearance). A genus of vine-like, woody plants, including Virginia creeper, or American woodbine, much used for ornamental decoration of buildings. In autumn the dying leaves of ampelopsis turn a most brilliant red and yellow. The vine called Japanese ivy or Boston ivy belongs to this same genus of plants, and is probably the favorite of all the hardy vines grown in cities in the eastern United States. It is especially effective for a considerable area from Massachusetts to Florida and on the Pacific coast, but north of the Ohio and west of the Mississippi River it is tender. *Fossil forms.*—A single fossil species of this genus, Ampelopsis tertiaria, has been recognized in the White River beds of the Tertiary in Wyoming.

AMPERE, ăm-pâr′ (Derived from the name of Ampère). The practical unit employed in measuring the intensity of an electric current, and technically defined as one-tenth of the C.G.S. electro-magnetic unit (see ELECTRICAL UNITS) of current. By intensity of current is meant the quantity of electricity which passes any cross section of the wire or conductor in the course of one second of time. The current depends upon the resistance of, and the difference of potential at the ends of, the conductor, varying inversely as the former and directly as the latter. From Ohm's law that $C=\frac{E}{R}$, when C is the current, E the difference of potential, and R the resistance, we have $\text{amperes}=\frac{\text{volts}}{\text{ohms}}$. A current of electricity can do work in decomposing certain chemical substances into their respective elements, consequently by measuring the amount of a substance so decomposed in unit time we can ascertain the strength of the current. The ampere, accordingly, has been legally defined as the amount of a constant current which, when passed through a solution of nitrate of silver, in accordance with standard specifications, deposits silver at the rate of 0.001118 of a gram per second. The detailed specifications prepared by the National Academy of Sciences of the United States provide that in measuring currents of about one ampere in strength the silver voltameter (q.v.) employed should consist of a platinum bowl as the cathode, containing a neutral solution of pure silver nitrate in the proportion of 15 parts by weight of the nitrate to 85 parts of water, and an anode consisting of a disk or plate of pure silver wrapped with pure filter paper. Precautions are to be observed to insure cleanliness and accuracy of measurement before, during, and after the experiment. The silver deposited in the platinum bowl is then washed and weighed, and the gain in weight expressed in grams is divided by the number of seconds during which the current passed and by 0.001118. Within the past few years it has been proved that the quantity of silver deposited in a voltameter depends upon many conditions previously unsuspected, such as the age of the solution, the construction of the voltameter, etc. For full details as to our present knowledge of the subject, the reader should consult a paper by A. Leduc on the electro-chemical equivalent of silver, copper, and water, in the *Reports of the International Congress of Physics at Paris*, Volume II. (1900), and the original report of the National Academy of Sciences on *Standards for Electrical Measure.*

AMPÈRE′ äɴ′pâr′, ANDRÉ MARIE (1775-1836). A distinguished French physicist, mathematician, and naturalist, born at Lyons. The death of his father under the guillotine in 1793 made a deep and melancholy impression on the mind of the young man, and he sought solace in the study of nature and the Latin poets. In 1801, after he had been engaged for some time as private mathematical tutor at Lyons, he became professor of physics in the Central School of the department of Ain at Bourg. He was afterwards professor of mathematics at Lyons. He was called to Paris, where he distinguished himself as an able teacher in the Polytechnic School. He began his career as an author by the essay on the mathematical theory of chances, *Sur la théorie mathématique du jeu* (Lyons, 1802). In 1814 he was elected a member of the Academy of Sciences, and in 1824 was appointed professor of experimental physics in the Collège de France. Science is largely indebted to Ampère, especially for his electro-dynamic theory and his original views of the identity of electricity and magnetism, as given in his *Recueil d'observations électro-dynamiques* (Paris, 1822), and his *Théorie des phénomènes électro-dynamiques* (Paris, 1826). Ampère was the inventor of the astatic needle (q.v.), which made possible the modern astatic galvanometer (q.v.). He was the first to show that two parallel conductors carrying currents traveling in the same direction attract each other, while if traveling in opposite directions they repel each other. Ampère also formulated the theory that there were currents of electricity circulating in the earth in the direction of its diurnal revolution which attracted the magnetic needle. The ampere (q.v.), or unit of the strength of an electrical current, is named after him. Ampère's scientific papers are largely contained in the *Annales de Physique et de Chimie.* A eulogy by Arago, delivered shortly after his death, which contains an account of his life, will be found translated into English in the annual report of the Smithsonian Institution for 1872 (Washington, 1872).

AMPÈRE, äɴ′pâr′, JEAN JACQUES ANTOINE (1800-1864). A French academician, essayist, literary historian and professor in the Collège de France. He was born at Lyons, the son of André Marie Ampère. His essays, collected as *Littérature et voyages* (2 volumes, 1834), attest his knowledge of foreign countries and their literatures. Better known are the essays on the formation of the French language, *Histoire de la formation de la langue française* (1841), and *La Grèce, Rome et Dante* (1850). Ampère was a judicious critic, a profound scholar, and master of a precise style. Consult Potton, *Etudes sur la vie et les travaux de Jean Jacques Ampère* (Paris, 1867).

AMPERE TURNS. In problems involving the magnetic field produced by a current flowing in a coil of wire, two of the factors necessary are the strength of current in amperes, and the number of turns or revolutions that the conductor through which the current passes makes in forming the coil or solenoid. Their product is known as the ampere turns.

AMPHIARA′ÜS (Gk. Ἀμφιάραος, *Amphiaraos*). A Greek chthonic divinity. At Oropus he had a celebrated oracle, healed the sick, was honored with games, and was worshiped elsewhere as a hero and prophet. In legend Amphiaraüs is prominent in the war of the Seven against Thebes, into which he was forced by the treachery of his wife, who was bribed by Polynices. As he fled from the victorious Thebans, Zeus caused the earth to open and engulf Amphiaraüs with his horses and chariot. He was a descendant of the seer Melampus, and son of Oïcles and Hypermnestra. According to later writers, he took part in the Calydonian hunt and the Argonautic expedition.

AMPHIB'IA (Gk. *ἀμφί*, *amphi*, on both sides + *βίος*, *bios*, life). A class of vertebrates intermediate between fishes and reptiles. It was made by Linnæus to comprise reptiles, amphibia, and cartilaginous fishes, but has been restricted, until now it is equivalent to Batrachia, and includes frogs, toads, newts, salamanders, the snake-like Gymnophiona and gigantic extinct forms, the Stegocephali. As adults, many, but not all of them, are able, either by the possession of lungs or by means of skin respiration, to come from water to land; hence their name.

DISTINCTIVE CHARACTERISTICS. All the free-developing amphibia possess gills in the larval stage that, in some forms, persist throughout life. The skin is soft and glandular, and serves in part or wholly to aërate the blood. The outer layers of the skin become cornified and are periodically shed, and in a few cases there is a bony dermal skeleton. The paired fins of fishes are replaced by pentadactyl legs. In some forms, as in sirens, one pair of limbs may be wanting, and in such forms as Gymnophiona both pairs may be lacking. The mouth is terminal and the teeth are firmly ankylosed to the supporting bones. The tongue, when present, is bifid, and is so fixed at the front of the mouth that the free end turns backward. The mouth and pharynx are ciliated and into them open the internal nares. The alimentary tract is nearly straight in the elongated forms, or it may be much convoluted, as in the case of vegetable feeding tadpoles. There is a two-lobed liver and a pancreas. The lungs are thin-walled sacks that may have internal folds, but some salamanders are lungless. The heart is usually composed of two distinct auricles, one ventricle, and a conus arteriosus. The red blood-corpuscles are oval, nucleated, and large in comparison with those of warm-blooded vertebrates.

BREEDING HABITS. The eggs may be fertilized internally or externally, just as they are being deposited in the water. In most cases they are left to chance, but in some species are carried in strands, or otherwise cared for by the male or female. A few have brood-pouches, and one toad rears its young in pits in the skin of the back. A few forms bring forth their young in an active condition. The gill-bearing or larval stage (axolotl) of Amblystoma tigrinum is capable of breeding, and under certain conditions may undergo its metamorphoses. (See AXOLOTL.) The eggs are pigmented and usually undergo total and unequal segmentation. They possess a large amount of yolk, so much in a few cases, such as pipa, that the embryo lies coiled over the egg as though it were a fish. The blastula and gastrula stages are present, but are modified in form and manner of development by the presence of the yolk; the medullary groove develops by a pair of upfoldings along the middle of the back, and by fusion of head and body, the tail becomes marked off; on the neck are two or three pairs of external gills. At about this time the tadpoles hatch, and begin to swim about or adhere to weeds by means of the sucker on the ventral surface of the head. At first the tadpole has no mouth, but soon one develops, the external gills dwindle and are replaced by the internal, which are covered by a fold of skin. The hind limbs are the first to appear externally, lungs develop, and the larva can breathe both on land and in water. The gills of the Anura continue to dwindle and likewise the tail is gradually and completely absorbed. Tadpoles as well as some adult amphibia have the power of reproducing lost parts. See TOAD.

The early stages of amphibians are not always passed in water. Some of the European salamanders are viviparous, the young being born all developed, but still requiring water. The young of the viviparous Cæciliidæ, however, take to a terrestrial life as soon as they are born. So, too, certain frogs (e.g. Rana opisthodon, of the Solomon Islands) hatch from eggs laid out of the water as perfect, air-breathing frogs. In many species, as in the persistent gilled Urodela, the adult lives chiefly in the water; in other cases, as in the other Urodela, the Cæciliidæ, and the Anura, the adult lives on land.

HABITS. The adult Amphibia feed on worms, slugs, and insects. Hence they are all useful to agriculture. None has a poisonous bite, but all trust largely for safety to acrid or poisonous secretions from the skin-glands. The tadpoles subsist almost entirely on water vegetation, such as algæ. In cold or dry seasons Amphibia preserve themselves by burrowing down into mud and earth, and there fall into a lethargic sleep. Most Amphibia keep near water, and their young develop in it. A few forms that live in mountains, in trees, or on dry, porous volcanic islands, bring forth their young well enough developed to breathe the air, thus approaching a reptilian condition of development. Many, but not all, amphibians are nocturnal, being most active in their search for food or mates in the early morning or evening hours.

GEOGRAPHICAL DISTRIBUTION. The amphibia thrive best in warm and moist countries. A few live in the temperate zone, some frogs penetrating far north, but not so far as the polar regions. The order of relative abundance of amphibia in the different countries is as follows: Tropical America, India, Africa, Australia, North America, Europe. Many families and genera have a very limited range, since, although fresh water is a necessity to them, the sea is a complete barrier to their spread. Salamanders are confined mainly to Europe and North America, and only toads and frogs are of world-wide distribution.

CLASSIFICATION. There are four orders of Amphibia: the Urodela (q.v.), possessing a tail throughout life (newts and salamanders); the Anura (q.v.), without tail in the adult stage (frogs and toads); the Gymnophiona (q.v.), snake-like, without limbs, and blind, and the Stegocephalia (q.v.), and other extinct often gigantic tailed forms fossil in the Carboniferous, Permian and Trias rocks. The existing species number about 1000.

ANCESTRY. The Amphibia have doubtless sprung from fish-like ancestors, and the link with that ancestry is found in the fossil group of Stegocephalia, whose head carries great plates. The piscine group from which the Amphibia arose must have been either the Dipnoi, which are to-day largely air breathers, or the Crossopterygii. Gadow, in 1901, gave the following features of Amphibia as those that proclaim their piscine descent: (1) The possession by the heart of a long conus arteriosus (anterior to the ventricle) provided with, in many cases, numerous valves, on at least (in Anura) one series at the base, another at the beginning of the truncus where the arches branch off; (2) the strictly symmetrical arrangement of these arches; (3) the three-chambered heart is still like that of Dipnoi; (4) the occurrence of as many as four or even five branchial skeletal arches in the larval stage; (5) the glottis (or entrance to windpipe) is supported by cartilages which themselves are derivatives of posterior visceral arches; (6) the development (in Urodela as in Stegocephalia) of the vertebræ from four pairs of elements called arcualia, and the formation of the intervertebral joints by a split across the intervertebral ring of cartilage; (7) the hypoglossal nerve still lies outside and behind the skull as a cranial nerve; (8) the presence of lateral sense organs; (9) the possession of external gills as in Dipnoi and Crossopterygii. It is frequently assumed that the first Urodela were aquatic creatures, provided with a finned tail and small lungs. Gadow believes these to be larval acquisitions, not ancestral reminiscences. The fact that the ancestors of Amphibia evolved the pentadactyl condition proves that they were land animals. The evolutionary change through which the early Amphibia passes are thus enumerated by Gadow.

(1) "Terrestrial, with two pairs of pentadactyloid limbs; breathing by lungs only; with a fully developed apparatus of five pairs of gill-arches, which during the embryonic life perhaps still carried internal gills, with or without several pairs of gill clefts. Reduction of the dermal armor and of the cutaneous scutes had taken place.

(2) "Additional respiratory organs were developed by the embryo, in the shape of external gills; these were at first restricted to embryonic life (as in the existing Apoda), but were gradually used also during the aquatic life of the larva. These external gills, together with the lungs, have superseded the internal gills, of which there are now no traces either in Urodela or in Anura.

(3) "Some Urodela, retaking to aquatic life, retained and further enlarged the external gills into more or less permanent organs. The majority of Urodela hurry through the larval, aquatic stage, and some—e.g., Salamandra atra—became absolutely terrestrial. The possession of unusually long external gills by this species and by the Apoda indicates that these organs are essentially embryonic, not larval, features."

BIBLIOGRAPHY: The foremost systematic writers upon this group are G. A. Boulenger, of the British Museum, and E. D. Cope. The latter has completely monographed North American forms in "Batrachia of North America," *Bulletin 34, United States National Museum* (Washington, 1889). This discusses the larger relations of the group, and gives an extensive bibliography. For a still more recent general treatise, consult H. Gadow, "Amphibia," *Cambridge Natural History*, Volume VIII. (Cambridge, 1901). See ALIMENTARY SYSTEM (Evolution of) and similar articles relating to comparative anatomy.

AMPHIBIA, FOSSIL. See STEGOCEPHALIA.

AMPHIB′IOUS PLANTS. A remarkably plastic group, generally classed among water plants (Hydrophytes, q.v.). Not only are these plants able to endure life in wet or dry habitats, but their leaves often show remarkable variations. (See LEAF.) Shallow ditches commonly furnish good illustrations of amphibious plants.

AM′PHIBOLE (Gk. ἀμφίβολος, *amphibolos*, doubtful, ambiguous; alluding to its being easily confounded with augite). An important group of rock-making minerals closely allied to the Pyroxene (q.v.) group. The amphiboles are metasilicates, principally of calcium, magnesium, or iron, and sometimes also of manganese, sodium, and potassium. The group is subdivided according to the forms of crystallization. Those that crystallize in the orthorhombic system include Anthophyllite and its variety Gedrite; the monoclinic section includes the typical mineral Amphibole with its varieties, as well as Glaucophane, Crocidolite, and certain other minerals; while the triclinic section includes Ænigmatite. All of these minerals have a common prismatic cleavage of from 54° to 56°, and also agree in their optical characters and chemical composition.

The most important member of the group is the mineral Amphibole, which gives its name to the series. The several varieties of amphibole are divided into two groups, according as they do or do not contain aluminum. The non-aluminous varieties include Tremolite, a calcium magnesium silicate that is usually white to dark gray in color, and is found both in crystals and massive; Actinolite, a calcium magnesium and iron silicate of varying shades of green; Grünerite, an iron silicate which is of a brown color that occurs in fibrous masses. The aluminous varieties include the several varieties of Hornblende, which comprises the dark green and black varieties, known as common Hornblende (black), Pargasite (green and blue), and Edenite (white, gray, and pale green). These minerals are found in crystalline metamorphic limestones, granitic, and schistose rocks, and in volcanic or igneous rocks. Nearly every member of the group has several varieties, each of which, besides having a separate name, differs from the type by some slight variation in color, optical properties, or chemical composition. Many varieties of amphibole have been cut as gem-stones.

AMPHIBOLITE. A metamorphic rock composed largely of an amphibole mineral, usually hornblende.

AMPHIC′TYON′IC COUN′CIL (from *Amphictyon;* see below). A celebrated religious congress of the confederated tribes of ancient Greece, which met twice every year at Delphi and Thermopylæ. The meetings at Delphi took place in the temple of Apollo, those at Thermopylæ in the temple of Demeter, which was in the village of Anthela. The congress was composed of the deputies of twelve tribes, the list of which is given differently in different authors. The list of Æschines (containing but eleven names) is as follows: Thessalians, Bœotians, Dorians, Ionians, Perrhæbians, Magnetes, Locrians, Œtæans, Phthiots, Malians, and Phocians. The twelfth tribe was probably either the Dolopians or the Ænianians. (See Pausanias, ix. 8. and Herodotus, vii.: 132; also Cauer in Pauly-Wissow's *Realencyclopädie*). Each tribe sent two members who possessed equal authority. Tradition connects the origin of the Amphictyonic Council with Amphictyon, son of Deucalion, or with that of

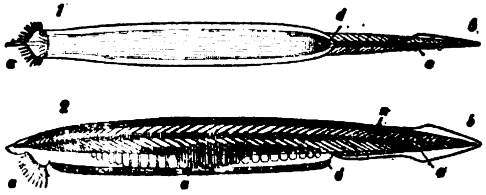
Androtion. We may at least be sure that the institution was one of great antiquity. Its importance declined in the course of time, and by the third century B.C. it had lost much of its old authority. The duties of the Council were primarily religious, and were connected with the care of the temple of Apollo at Delphi and the protection of the holy lands, treasures, and other perquisites of the god. It was also intrusted with the preparation and direction of the Pythian Games. The duty of protecting the property of Apollo carried with it the power to prosecute and punish all who in any way injured the majesty of the god. Thus the Council possessed important judicial rights, and, as it also had power to regulate matters relating to peace and war among the different members of the federation, it in time acquired political importance also. The members bound themselves by an oath not to destroy any city of the Amphictyons or cut off their streams in war or peace; also, if any State should break this oath, to unite in proceeding against and destroying such a State. There were in early times various other amphictyonies, or associations of tribes, among the Greeks, as at Argos, Delos, and elsewhere, but little is known of these. Consult: Tittmann, *Ueber den Bund der Amphictyonen* (Leipzig, 1880); and Freeman, *History of Federal Government* (2d ed. London, 1893).

AMPHIL'OCHUS (Gk. 'Αμφίλοχος, *Amphilochos*). In legend, a son of Amphiaraüs, and, like him, worshiped as a prophet at Oropus and elsewhere; one of the Epigoni (q.v.), and founder of Amphilochian Argos in Ambracia. Another group of legends connected Amphilochus with Cilicia and Pamphylia, where he was said to have gone after the Trojan War, in which he took part as a suitor of Helen. With Mopsus, he founded Mallus, but later they quarreled and killed each other. Their graves were shown at Mallus, where was also an oracle of Amphilochus.

AM'PHINEU'RA (Gk. ἀμφί, *amphi*, around + νεῦρον, *neuron*, sinew, nerve). A class of mollusks, characterized by the peculiar arrangement of the nervous system. There are two lateral and two ventral nerve trunks bound together by numerous commissures and provided with ganglion cells throughout their whole length. Anteriorly these cords pass into the cerebral ganglion, which, however, is often hardly more than the upper half of a ring which encircles the œsophagus. The amphineura are bilaterally symmetrical and have the foot somewhat like that of the gastropods. They either have a shell of eight pieces or there is no shell at all. They are all marine forms, chiefly of the warmer seas, and rarely reach a large size. There are two distinct orders, the Polyplacophora, or Chitons (q.v.), and the Aplacophora, or Solenogastres. The latter are degenerate, worm-like animals of small size, without a shell, the foot, mantle, and mantle-cavity greatly reduced, and in some forms almost wanting. Only a few recent species are known.

AMPHI'ON (Gk. 'Αμφίων). In mythology, son of Zeus and Antiope, twin brother of Zethus. The story of Antiope and her sons existed in many local forms, but the accepted version of later times was found in the *Antiope* of Euripides, of which only fragments have been preserved. Antiope, dragged from her refuge at Sicyon by her uncle, Lycus of Thebes, bore the twins on Mount Cithæron, where they were exposed, but found, and reared by a shepherd. Antiope, cruelly mistreated by Lycus and his wife Dirce, fled to the mountain, where she found her sons. To avenge her wrongs, the twins tied Dirce to the horns of a wild bull, and captured Lycus, who surrendered Thebes, which they fortified. Amphion charmed the stones into place by his lyre. The characters of the brothers are sharply contrasted: Zethus, the rough huntsman, and Amphion, the gentle musician. Amphion and Zethus were honored at Thebes as Dioscuri, as Castor and Pollux at Sparta. Amphion married Niobe (q.v.), and was killed by Apollo, or committed suicide when his children were killed. The punishment of Dirce is the subject of a celebrated group of statuary—"The Farnese Bull"—by Apollonius and Tauriscus of Tralles, found in the Baths of Caracalla in Rome in 1546, and now in the Naples Museum. It is a work of the early part of the first century B.C., but has been much restored.

AM'PHIOX'US (Gk. ἀμφί, *amphi*, at both ends + ὀξύς, *oxus*, sharp). A small, bilateral, translucent, marine animal, about two or three inches long, thought by some to be an offshoot of the primitive vertebrate stock, and by others to be a degenerate, primitive vertebrate. The amphioxus or 'lancelet' has no well-defined brain, but a persistent and unsegmented notochord. The muscles are arranged in sixty-two V-shaped myomeres dovetailed into one another. The single mouth and anus are in the median line. There are no limbs, ears, sympathetic nerves, or genital ducts. The gill-slits, which are numerous and supported by bars, open from the mouth into the atrial chamber, which has one opening to the exterior, the atrial pore. The best-known species is Amphioxus lanceolatus, which dwells buried in sand near the seashore line. Its food, which consists mainly of diatoms, is sucked into its mouth. The adults swim about in the evening only, but the young are very active. The segmentation of the egg is complete, and results in the formation of a blastosphere, which invaginates to form a gastrula. The medullary groove is formed by a sinking of the ectoderm along the mid-dorsal line. The cavity of the gastrula becomes the gut of the adult. In the active early life of the embryo the ectoderm is ciliated. The simplicity of its development has made the amphioxus a favorite object of study for the descriptive and experimental embryologist. If the two cells which are the result of the first segmentation are separated, each cell will develop into a complete individual one-half the size of the normal embryo. Incom-



AMPHIOXUS.

1. Ventral view of the entire animal lying on its side. 2. Side view. *a*, anterior end, showing cirri about the hooded mouth; *b*, caudal fin; *c*, anus; *d*, atripore or excurrent orifice for the water constantly taken in at the mouth; *e*, generative organs; *n*, notochord.

plete separation results in the formation of double or Siamese-like twins. Compare BALANOGLOSSUS; and consult A. Willey, *Amphioxus and the Ancestry of the Vertebrates* (New York, 1894). See the articles on the evolution of the alimentary, circulatory, muscular, nervous, and respiratory systems, under ALIMENTARY SYSTEM, etc.

AMPHIP'ODA (Gk. nom. neut. pl., from ἀμφί, *amphi*, around + πούς, *pous*, foot). An order of crustaceans, distinguished by the sessile, lateral eyes, and the greatly compressed body. They are mostly of small size, and some very minute. Their name alludes to the peculiar arrangement of the so-called walking-feet, four pairs of which point forward and three backward. The abdomen or "tail" is also a powerful locomotive organ, and assists the animal in jumping, which is its usual mode of progression. Even in swimming its movements are chiefly a succession of jumps. The amphipods are usually plainly colored, but some forms are very handsome. A large number of species is known, but zoölogists are by no means agreed as to their classification, some making only two, and some as many as nine, families. They occur in both fresh and salt water, and are especially abundant along sandy beaches, where they skip about in such a lively manner that they are called beach-fleas or sand-hoppers. They are widely distributed over the world, occurring even in the Arctic regions, and are of great practical importance as food for fishes. See BEACH-FLEA, and CRUSTACEA.

AMPHIP'OLIS (Gk. 'Αμφίπολις). A city of ancient Macedonia, situated in a deep bend of the Strymon, about three miles from the sea (Map: Turkey in Europe, D 4). Its position made it important as the port of entry for the fertile Strymon Valley and Thrace; and the neighborhood yielded timber for ships, as well as gold and silver. It belonged originally to the Edonians, a Thracian people, and was called, on account of the roads which met here, 'Εννέα 'οδοί (Nine Ways). The first who attempted to colonize it, Aristagoras of Miletus, was cut off with his followers by the Edonians. The Athenians next tried to gain possession of it. Their first army, amounting to 10,000 men, was utterly cut to pieces at Drabescus, 465 B.C., but their second, 437 B.C. under Hagnon, son of Nicias, was successful. The Thracians were expelled and a new city built, to which Hagnon gave the name Amphipolis, because it had the river on both sides. Owing to its mixed population, Amphipolis was not friendly to Athens, and in 424 B.C. readily joined the Spartan Brasidas. The Athenian general, Cleon, having been sent to recover the city, was defeated and slain in a battle fought near its walls in 422 B. C., Brasidas also falling in the engagement. Though nominally restored to Athens by the peace of Nicias, Amphipolis seems to have remained independent until its surrender to Philip of Macedon. At Amphipolis was situated the chief mint of the Macedonian kings, and under the Romans it was the capital of Eastern Macedonia. In the Middle Ages it was called Popolia. Its site is now occupied by a Turkish town, but a few of its ruins are still visible. Consult: Leake, *Travels in Northern Greece* (London, 1835); and Heuzey and Daumet, *Mission archéologique en Macédonie* (Paris, 1876).

AM'PHISBÆ'NA (Gk. ἀμφίς, *amphis*, on both ends + βαίνειν, *bainein*, to go). The type genus of a family of degraded, limbless lizards, of the general appearance of snakes or worms, found only in the West Indies and South America. The best known is the sooty or dusky species, Amphisbæna fuliginosa. The body is 18 to 24 inches long and nearly the same thickness throughout; head small, eyes small, ears covered with skin, and tail very short. It tunnels under ground, feeding on insect larvæ and worms. As it moves either way with equal ease, rumor gave it two heads, and asserted that when cut in twain the parts would find each other and reunite. Its dried and pulverized flesh was supposed to possess miraculous curative properties.

AMPHIS'SA (Gk. 'Αμφισσα). The official name of Salona, the capital of the Greek nome of Phocis (Map: Greece, D 3). It is situated 31 miles northeast of Lepanto, at the western foot of the Parnassus, a few miles from the site of Delphi. The town lies in a fertile plain, and has trade in oil, tobacco, and grain. A road runs to the harbor of Itea, five miles to the south, on the Bay of Salona. It is on the site of the ancient Amphissa. Pop., 1896, 5416.

AM'PHITHE'ATRE (Gk. ἀμφιθέατρον, *amphitheatron*, a double theatre, from ἀμφί, *amphi*, on both sides + θέατρον, *theatron*, a theatre). An architectural structure invented by the Romans for exhibiting gladiatorial combats, fights of wild beasts, and other spectacles. These contests were at first given in the Roman Forum, within hastily contrived wooden scaffoldings, or in the Circus. But in 59 B.C., Curio, wishing to surpass all his predecessors in the sumptuousness of his shows, erected two wooden theatres, back to back, where dramatic performances were given simultaneously; and when these were over the two theatres were made to revolve and close up. Their tiers of seats inclosed an arena suited for the contests which then followed. Perhaps the model was found in the cities of Campania; for Pompeii had an amphitheatre as early as 70 B.C. Cæsar first erected, in 46 B.C., a permanent structure of this kind in wood, and it was called *amphitheatre*, from its shape, or *theatrum venatorium* or "theatre of the chase," from the kind of contests held in it. Still, combats of gladiators and wild beasts continued to be given in the Circus and the Forum. In 30 B.C., under Augustus, Statilius Taurus built the first amphitheatre that was partly of stone, in the Campus Martius: it remained the only one in Rome not entirely of wood until the erection of the Coliseum by Vespasian, whose son and successor, Titus, dedicated the edifice in 80 A.D. Even the upper part of the Coliseum itself was originally of wood until the restoration, after a great fire, in 223. The example of Rome was followed by all the cities of any importance throughout the Empire, where the love of bloody sports, so repugnant to the Greeks, spread rapidly. Amphitheatres were erected throughout Italy and Sicily (Verona, Puteoli, Capua, Pola, Syracuse, Pompeii, etc.), Spain (Tarragona, Italica), France (Arles, Nîmes, Bordeaux, Saintes, etc.), England (Silchester, Cirencester), Germany, North Africa (El-Jemm), Asia Minor (Pergamum, Cyzicus), Greece (Corinth, Sparta.) The ruins of almost a hundred have been found. Those that are well preserved are among the finest remains of Roman architecture. Whenever possible, the natural lay of the ground was utilized to save expense, by cutting part of the seats in the natural rock and using the hillside as an incline. But in most cases the amphitheatres were entirely free-standing structures of elliptical shape, built of brick, stone, and marble. The Coliseum at Rome seated 87,000 persons, according to a document of the fourth century; but Hülsen believes that there were that number of running feet of benches, and that only about 50,000 persons could be seated. Its greatest length is 616 feet, its greatest breadth 510 feet. Several others are of about the same size, as, for example, those at Pozzuoli, Capua, Italica, Verona, Tarragona, El-Jemm. The exterior wall of the Coliseum, 160 feet high, was divided into four stories; the three lower ones consisted of a series of arcades framed by architraves and pilasters, the lowest, Tuscan-Doric; the second, Ionic; the third, Corinthian, according to a common Roman usage. The upper story was broken merely by windows and pilasters, as well as by the high masts to support the awnings. The lower arcades served as entrances; four were main entrances; seventy-six were numbered entrances leading to the staircases. The arcades of the second and third stories opened on the covered promenade galleries, passage-ways, and staircases. To the upper story were fastened the great awnings, which protected the spectators from the sun when necessary. Other amphitheatres vary, from two stories at Nîmes, to three at Verona, three and a basement at Pola, to four at El-Jemm. The arrangements were as follows at the Coliseum: There were four tiers, or stories, of seats, forming the *cavea*, and corresponding to the four external stories. Under their foundations were five concentric corridors communicating with the staircases; and the raking vaults that support the seats and staircases are one of the most superb and impressive parts of the structure. The interior of the *cavea*, or place for the spectators, had three sections: the lower one, or *podium*, with the seats and thrones of honor; the *mæniana*, or lines of steps for the seats; the *porticus*, or portico. The podium was a platform immediately above the arena, reserved for the Emperor and other persons of greatest distinction, and crowned with special boxes and balconies. The mæniana were in three horizontal sections, where the spectators could be seated according to their rank; the equestrian order in the lower, the citizens in the middle, and the general populace in the upper section. Ordinarily, the women were obliged to be satisfied with the highest places under the portico. Each row of seats was numbered and the places chalked. A large *personnel* kept order. The central space, measuring 280 by 176 feet, in which the contests took place, was called the arena and was encircled by a low wall to protect the podium from the wild beasts. Under it was an elaborate system of substructures, not only for under-draining, but also for housing men and animals, with wells, windlasses, and inclined planes for hoisting the animals, and other means of communicating with the arena—such as the *vomitoria*—and with the outside—such as passages to the imperial palaces. Especially interesting is a row of beasts' dens following the oval outline of the arena above. The Coliseum has not preserved its seats; those at Verona and Nîmes have. Neither is the entire circuit of outer wall as well preserved in the Coliseum as at these cities or at Pola. At Capua and Pozzuoli the substructures of the arena are in perfect condition. Consult: Friedländer, *Sittengeschichte Roms* (Leipzig, 1881-90): De Ruggiero, *Dizionario epigrafico* (Rome, 1887-93); Middleton, *Remains of Ancient Rome* (London, 1892); Daremberg and Saglio, *Dictionnaire des antiquités grecques et Romaines* (Paris, 1881-92), and Baumeister, *Denkmäler des klassischen Alterthums* (Munich, 1885-88).

AM'PHITRI'TE (Gk. Ἀμφιτρίτη). The daughter of the sea-god Nereus and of Doris, and the wife of Poseidon. Amphitrite was worshiped only in company with Poseidon, and appears with him on many painted votive tablets from Corinth. Her marriage forms the subject of a fine Roman marble relief, in Munich, with Poseidon, representing her as drawn in a car by Tritons, surrounded by Nereids and sea-monsters. She also appears with Poseidon in representations of assemblies of the gods.

AMPHIT'RUO, or **AMPHIT'RYON.** A comedy or burlesque by Plautus (q.v.), based on the legend of Jupiter and Alcmene, Amphitryon's wife. Its Greek prototype is unknown.

AMPHIT'RYON (Gk. Ἀμφιτρύων). Legendary son of Alcæus of Tiryns. He accidentally killed Electryon, father of Alcmene (q.v.), King of Mycenæ, for which deed he was expelled from Mycenæ. He took refuge in Thebes with his wife Alcmene. Here she became the mother of Heracles by Zeus, and of Iphicles, by Amphitryon. Amphitryon's tomb and the ruins of his house were shown in Thebes in the days of Pausanias.

AMPHITRYON. (1) A comedy of Molière, produced in 1668, and taken from that of Plautus. (2) An opera by Grétry, the words being by Sedaine, produced in Paris, 1781. (3) A comedy by Andrieux, presented in 1782. There are also operas with this title in Italian, Portuguese, and Swedish.

AMPHITRYON, OR THE TWO SO'CIAS. A comedy by Dryden, with musical portions, produced in 1690. It was adapted from Molière's play.

AMPHIU'MA (Corruption from Gk. ἀμφί, *amphi*, on both sides + πνεῦμα, *pneuma*, breath, referring to the gill). A genus of tailed amphibia that loses its tadpole gills but retains in the adult stage one gill-slit on each side of the neck; hence it is half-way between the mud-puppy (Necturus), which retains its external gills throughout life, and the newts, which retain neither gills nor slits. See CONGO-SNAKE.

AM'PHORA (Gk. ἀμφορεύς, *amphoreus*, Homeric ἀμφιφορεύς, *amphiphoreus*, from ἀμφί, *amphi*, on both sides, and φέρειν, *pherein*, to carry). Among the Greeks and Romans, a large vessel, usually made of clay, with a narrow neck and two handles. Many amphoræ ended in a sharp point below for insertion in a stand or in the ground. The pointed form of the amphora was used for preserving wine and oil, as in the Panathenaic amphoræ. A peculiar tall and slender form was the Loutrophoros, which was used for water for the bridal bath and to mark the graves of the unmarried. The amphora appears in a great variety of forms among the

Greek painted vases. Amphora was also a liquid measure in Rome, equivalent to 26.26 litres, or about seven gallons. The name was also given sometimes to the Attic metretes—equal to about 11 gallons. In modern times, *anfora* is the name of a wine-measure in Venice. See VASE.

AMPHORÆ.

AM′PLIFICA′TION (Lat. *amplus*, large + *facere*, to make). A term in rhetoric, meaning that an idea, an opinion, or an inference is presented to the mind accompanied by accessory circumstances. Its aim is to make a powerful and vivid impression on the reader or the hearer. It is generally produced by breaking up general statements into particulars, by employing some form of repetition, by adding illustrative details, and by quotation. Consult Genung, *The Working Principles of Rhetoric* (Boston, 1901).

AM′PLITUDE (Lat. *amplitudo*, from *amplus*, large). In astronomy, the angular distance of a heavenly body, at the time of its rising or setting from the eastern or the western point of the horizon. When the sun is in the equator (i.e., at the time of either equinox), he rises exactly east and sets exactly west, except for the small effects of refraction (q.v.) Therefore, at these times the amplitude is *zero*. His amplitude is at its maximum at midsummer, and again at midwinter; and that maximum depends upon the latitude of the place, being 23½° at the equator, and increasing to latitude 66½°, where it becomes 90°. The amplitude of a fixed star remains constant all the year round.

AMPTHILL, ămt′hĭll, FIRST BARON. See RUSSELL, ODO WILLIAM LEOPOLD.

AMPUL′LA (dimin. of *amphora;* in Greek, λήκυθος, *lēkythos*). Apparently a generic term among the ancient Romans for any little bottle of earthenware, glass, or other material, used for holding liquids or ointments. The *ampulla Remensis* (the holy vessel, Fr. *la sainte ampoule*) was the name of that famous vessel in which was contained the unguent (believed to have been brought by a dove from heaven) that anointed Clovis, King of the Franks, at Rheims in 496 A.D., and with which every succeeding monarch of France, down to Louis XVI., was anointed at his coronation. This ampulla was shattered, along with a great many more valuable things, at the Revolution of 1789; but a fragment of it was preserved by some devout royalist, and handed over at the restoration to the Archbishop of Rheims. Curious to say, a little of the miraculous substance still remained, and, being mixed with oil, was used to anoint Charles X. in 1825.

AM′PUTA′TION (Lat. *amputare*, to lop off, cut around). The cutting off of a part which, by its condition, endangers the safety, health or comfort of the patient. Injury, gangrene, and malignant growths are the most frequent causes for amputation. The amputation of a limb was in ancient times attended with great danger of the patient dying during its performance, as surgeons had no efficient means of restraining the bleeding. They rarely ventured to remove a large portion of a limb, and when they did so, they cut in the gangrened parts, where they knew the vessels would not bleed; the smaller limbs they chopped off with a mallet and chisel; and in both cases had hot irons at hand with which to sear the raw surfaces, boiling oil in which to dip the stump, and various resins, mosses, and fungi, supposed to possess the power of arresting hemorrhage. Some tightly bandaged the limbs they wished to remove, so that they mortified and dropped off; and others amputated with red-hot knives, or knives made of wood or horn dipped in vitriol. The desired power of controlling the hemorrhage was obtained by the invention of the ligature by Paré in the sixteenth century, and by the invention of the tourniquet (q.v.) in 1674 by a French surgeon, Morell. The ancient surgeons endeavored to save a covering of skin for the stump, having the skin drawn upward by an assistant previously to using the knife. In 1679, Lowdham, of Exeter, suggested cutting semicircular flaps on one or both sides of a limb, so as to preserve a fleshy cushion to cover the end of the bone. Both these methods are now in use, and are known as the "circular" and the "flap" operations; the latter is most frequently used.

A "flap" amputation is performed thus: The patient being placed in the most convenient position, an assistant compresses the main artery of the limb with an elastic band or a tourniquet. Another assistant supports the limb. The surgeon with one hand lifts the tissue from the bone, and transfixing with a long narrow knife, cuts rapidly downward and toward the surface of the skin, forming a flap; he then repeats this on the other side of the limb. An assistant now draws up these flaps, and the knife is carried round the bone, dividing any flesh still adhering to it. The surgeon now saws the bone. He then, with a small forceps, seizes the end of the main artery, and drawing it slightly from the tissues, an assistant ties it with a thread. All the vessels being secured with ligatures, after removal of the tourniquet, the flaps are stitched together with a needle and thread, or, if heavy, with silver wire. A suitable dressing is then applied.

AM′PYX (Gk. ἄμπυξ, a woman's head-band, a snood). A characteristic Ordovician genus, comprising about fifty species, restricted to North America and Europe, of blind trilobites, in which the central portion (*glabella*) of the head-shield is often armed with a cylindrical or angular sharp spine, the length of which in many species exceeds that of the entire body. Long curved spines are also developed upon the genal angles or posterior corners of the sides of the head-shield. The thoracic portion of the body is short, consisting of five or six segments, and the tail-shield is triangular and unarmed. For illustration, see Trilobita.

AM'RAPHEL. In Genesis xiv: 1, a king of Shinar, who by this name is mentioned as invading Palestine, together with Chedorlaomer, King of Elam, Arioch, King of Ellasar, and Tidal, King of Goiim. There is no account of this expedition in Babylonian literature, and none of the names has been identified with certainty. The chapter, as a whole, is generally regarded by the school of modern Bible critics as a very late *midrash*, and not wholly historical. But it is not impossible that the account of such an expedition has been drawn from Babylonian sources. The names of the four kings inspire confidence; and the expedition against the westland by Naram Sin furnishes a parallel. Schrader may therefore be right when he seeks to identify Amraphel with Hammurabi, the sixth king of the first dynasty of Babylon. A recently published cuneiform letter, in which this king's name is apparently given as Kimta-rapashtu, removes a part of the difficulty, since *rapashtu* is but the softened pronunciation of *rapaltu*. The expedition would, in that case, have taken place about 2250 B.C. As the connection with the Hebrew patriarch is likely to be a late development, no light is thrown by this identification on the historic character or date of Abraham. See Hammurabi.

AMR IBN AL-ASI, ăm'r 'b'n ȧl ä'sē (died 663 A.D.). An Arabian general. He was one of Mohammed's disciples, though before conversion a furious opponent. Chiefly to him were the Prophet's successors indebted for the conquest of Syria. In 639 he led 40,000 men into Egypt, and within three years effected the subjugation of the country. In 641, after a siege of fourteen months, he took Alexandria, losing 23,000 men. In the struggle between Ali and Moawiyah for the caliphate, Amr sided with the latter, and to him was due the triumph of the Ommiads over the Alids. From 661 to his death he was Emir of Egypt, and by his wise administration facilitated the conversion of the country to Islam. He is credited with projecting a canal to unite the Mediterranean and Red seas, and is charged with causing the destruction of the famous library at Alexandria; but the charge may well be dismissed, as it was not advanced until six centuries after his death. Consult Sir William Muir, *The Caliphate* (London, 1891).

AMRITSAR, ŭm-rĭt'sär (*Umritsar*). A city of the Punjab, India, in lat. 31° 40′ N. and long. 74° 45′ E., on the Sindh, Punjab and Delhi Railway (Map: India, B 2). It is the capital of a district of 1574 square miles, with a population of about 900,000, and of a division with an area of 5354 square miles and a population of about 2,750,000, both of the same name. Amritsar is, next to Delhi, the richest and most prosperous city in northern India, being connected with Lahore, the capital of the Punjab, distant 36 miles to the west, by a canal, and possessing considerable manufactures of cotton, silks, shawls, etc., and carrying on considerable trade. It is the religious metropolis of the Sikhs, a distinction which, along with its name, it owes to its "pool of immortality," on an islet of which stands the marble Darbar Sahib, the chief temple of the Sikh faith, maintaining an establishment of over 500 priests, and founded in 1574 by the minor apostle Guru Ram Das. Amritsar is a favorite pilgrim resort; and it was the place where, perhaps to bind the Sikhs more firmly, was signed the treaty of 1846, providing for the cession to the British of the territory between the Beas and the Sutlej. The huge Govindgarh, or fortress, built in 1809, is the most prominent feature of Amritsar. The town has a good water supply in connection with the Bari Doab Canal. It is a municipality of the first class, with a population of 136,766 in 1891, which increased to 162,429 in 1901.

AMRU. See Amr-ibn-al-asi.

AMRU-EL-KAIS, ăm'rōō-ĕl-kīs' (written also Amrulcais, and Amru'l-Kais). By many esteemed the greatest of Arabian poets. He has been by some authorities assigned to the beginning of the sixth century, but by others is described as contemporary with Mohammed. The accounts of his life are equally diverse, generally unreliable, and not infrequently legendary. He was the author of the first of the *Moallakât*, a collection of seven Arabic poems, which from their collective title ("Suspended") were once believed to have been hung in the Kaaba, at Mecca, but are now thought to have been so called as an indication of special excellence. His *Moallakât* was rendered into English by Sir William Jones (1782).

AMRUM, ăm'rōōm, or **AMROM,** ăm'rôm. One of the North Friesian Islands, on the west coast of Schleswig, Germany, south of the Sylt, an island of the same group (Map: Denmark, B 4). The island is about 6 miles long and has an area of about 8 square miles. On the west side are high sand-dunes. The island is unproductive, but contains monuments of former prosperity. The fishing and oyster gathering were formerly considerable, but have dwindled away; but of late Amrum has gained some importance as a watering-place. Pop., 1900, 900.

AMSDORF, ăms'dôrf, Nikolaus von (1483-1565). A German Protestant reformer, an early and determined supporter of Luther. He was born at Torgau, December 3, 1483, educated at Leipzig, and was among the very first students of the university at Wittenberg (1502), where he afterward taught philosophy and theology. He was with Luther at the Leipzig disputation (1519), and the Diet of Worms (1521), and in the privacy of his Wartburg seclusion. He assisted the first efforts at reformation in Magdeburg, Goslar, and Einbeck. He was active in the Smalkald debates, and spoke strongly against the bigamy of the Landgrave of Hesse. Amsdorf was made Bishop of Naumburg in 1542, was driven away in 1547 by the Imperial party during the Smalkaldic War, and took part in founding the University of Jena. In 1552 he became superintendent at Eisenach, where he died unmarried, May 14, 1565. He superintended the publication of Luther's works, and opposed Melanchthon on the separation of the High-Lutheran party. He is the author of the familiar dictum, "good works are prejudicial to salvation," by which he meant those works which man thinks in themselves certain to save his soul. For his biography, consult: T. Pressel, *Leben und ausgewählte Schriften der Väter und Begründer der lutherischen Kirche* (Elberfeld, 1862); also Meurer, vol. iii. (Leipzig, 1863).

AMSLER, ăms'lẽr, Samuel (1791-1849). An eminent engraver of the German school. He was born at Schinznach, in Switzerland, studied under Lips of Zürich, and afterwards under Hess, in Munich. His first great work was an engraving from a Magdalen by Carlo Dolci. In 1816 he went to Rome, where he joined the group of enthusiastic young Germans among whom Overbeck and Cornelius were prominent (see Pre-Raphaelites). Aided by Barth and Hildburghausen, he engraved a title-page for the *Lay of the Nibelungen*, from a design by Cornelius. During his second sojourn in Rome (1820-24), he began his great work, an engraving of "Alexander's Triumphal Procession," by Thorwaldsen. In 1829 he became professor of line-engraving at Munich, and in 1831 finished his large plate of the "Burial of Christ," by Raphael, which, with his engraving of a statue of Christ, by Dannecker, displayed the highest qualities of imitative art. His last great work was an engraving from Overbeck's "Triumph of Religion in the Arts." His style is marked by a clear and noble treatment of form, rather than by strong contrast of tones. Few engravers have equalled Amsler in his knowledge and representation of the works of Raphael, from whom he reproduced three Madonnas, the Tempi, Canigiani, and Connestabile.

AM'STERDAM, or **AM'STELDAM** (earlier *Amstelledamme*, the dam or dyke of the Amstel). The chief city of the Netherlands, situated at the confluence of the Amstel with the Y or Ij (pronounced Eye), an arm of the Zuyder Zee (Map: Netherlands, C 2). Amsterdam has an area of 18⅓ square miles, and has the shape of a semicircle, its diameter being the Y or Ij. The town is further cut up into six other concentric zones by canals. Other canals (or *grachten*) split up the city into ninety islands, crossed by about 300 bridges. Along these, rows of trees are planted, making the finest avenues of the city, of which the Singelgracht, seven miles long, the Prinsengracht, the Keizersgracht, and the Heerengracht, which is 147 feet wide, are the most handsome. The bridge over the Amstel, the Hoogeslüs, has thirty-two arches, is 620 feet long, and affords a fine view of the city and harbor. In the southern part of the city some of the canals have been drained and filled in to form broad streets, as also a portion of the Y, which now is the site of the central railroad station. The great square of Amsterdam is the so-called Dam, getting its name from its position on the west side of the old wall that is popularly believed to be the site of the city's first foundations. Around it are the royal palace, the exchange, and the Nieuwe Kerk (New Church), and from it as a centre radiate the principal streets and street-car lines of the city. Here is the monument to the loyalty of Holland during the Belgian revolution of 1830-31. It is called Het Metalen Krins, a reminiscence of the commemorative war medals then issued. Here, too, for one week in summer the boys of the city have the privilege of playing, because, it is said, in 1622 some boys here discovered a conspiracy of the Spaniards against the town.

Many of the buildings of the city are the Dutch brick style of the seventeenth century. They are all built on piles, because of the loose, shifting nature of the sandy soil near to its surface. It is necessary to go down from fourteen to sixty feet before a firm foundation can be secured. An interesting part of the city is the Jewish quarter, the Jews having formed an important section of the inhabitants from the middle of the seventeeth century. In this part of the city Spinoza lived.

Among the ecclesiastical structures of the city, the Nieuwe Kerk (New Church), or St. Catharine's Church, a cruciform basilica in the late Gothic style, erected in 1408-78, is the finest. The interior contains interesting remnants of old stained glass, a beautifully carved pulpit, executed by Vinckenbrinck in 1649, and the monuments of Admiral De Ruyter and the famous Dutch poet Vondel. The Oude Kerk (Old Church), a Gothic structure dating from about 1300, is noticeable for handsome stained-glass windows of the sixteenth century, and contains several monuments to naval heroes. In the Jewish quarter, the synagogue of the Portuguese Jews is interesting, as being built in imitation of Solomon's Temple; it also boasts of a considerable number of costly vessels. The handsomest secular edifice is the royal palace, built in 1648-55 as a *stadthuis*, or town hall, a massive structure resting on a foundation of 13,659 piles, and surmounted by a round tower rising 187 feet from the base, and commanding an extensive view. The gilded vane of the tower represents a merchant vessel. The building is adorned with numerous statues, bas-reliefs, and mural paintings, the interior profusely decorated by eminent Dutch sculptors and painters of the seventeenth century. All the principal apartments are lined with white Italian marble and richly adorned with sculptures, especially the magnificent reception room, an apartment of great splendor, and one of the largest halls in Europe, measuring 120 feet in length, 57 feet in width, and 100 feet in height. The building was converted into a royal residence in 1808, being presented by the city to King Louis Napoleon. The Rijks-Museum, a stately edifice, erected in 1877-85, in the early Dutch Renaissance style, with various Gothic and Romanesque characteristics, is richly adorned with statues of Dutch architects, painters, and sculptors, allegorical bas-reliefs, encaustic paintings, and figures in colored tiles, symbolic of the Dutch towns and provinces. The museum contains one of the most important collections of paintings and engravings in the world. The works of Rembrandt are especially well represented, and besides his most celebrated work, the so-called "Night Watch," include "De Staalmeesters," "The Jewish Bride," and one of his most finished portraits, that of "Elizabeth Bas." Van der Helst's "Banquet of the Arquebusiers" is another highly prized gem of this collection, which abounds in select paintings by the most famous Dutch and Flemish masters. The museum further includes an interesting department, showing the development of ecclesiastical art in the Netherlands from the Carolingian period to the seventeenth century, and a valuable collection of objects of industrial art. In the Fodor Museum may be seen 161 admirable paintings by modern Belgian, Dutch, and French artists; about 300 drawings by old masters, and about 100 engravings. The Six Gallery is a small but extremely valuable collection of paintings by the old Dutch masters, while the modern Dutch artists may be studied to great advantage in the Municipal Museum, containing about 200 select specimens.

Amsterdam has long been renowned as a centre of learning. The school known as the

Athenæum Illustre of Amsterdam, which was founded in 1632, in 1877 was reorganized as a university. The University Library now has more than 100,000 volumes, including the Rosenthal collection of 8000 works on Indian literature. It is rich in manuscripts and original letters, such as a Syrian New Testament and Cæsar's *De Bello Gallico* of the tenth century. Amsterdam possesses excellent facilities for medical study, as her hospitals are famous. Other educational institutions are State, normal, industrial, and commercial schools, the National Academy of Arts, the Royal Academy of Sciences, the Royal Dutch Geographical Society, a school of navigation, and a municipal school for primary teachers, besides a school of acting, set up by the Society for the Promotion of the Art of Acting. The Botanical Garden ranks among the foremost in Europe, and is equipped with a library and ethnographical museum. It was established by the Society Natura Artis Magistra, founder also of the Zoölogical Gardens. There are numerous other institutions of learning and scientific societies, the most remarkable of the latter being the Maatschappij tot Nut van't Algemeen, or Society for the Public Welfare, which has spread over all Holland. It was founded at Edam in 1784, and moved to Amsterdam in 1787. It aims at bettering the education and normal culture of the people, and strives toward this end in every conceivable way.

Amsterdam has six theatres, one of them owned by the city. Prominent among the benevolent institutions are the various orphan asylums, one of which, the Diaconic Asylum, erected in 1889, has about 1200 inmates.

For centuries Amsterdam has been the centre of Dutch industry, and its diamond polishing factories are the most extensive in the world. These are exclusively in the hands of the Portuguese Jews, and employ upward of 12,000 workmen. Machinery, ship building, and iron molding are important industries, and there are large refineries for borax and camphor in the town, producing over 22,000 tons annually. The preparation of rice for the market amounts to 23,000 tons yearly, and, besides, there are large glass-blowing establishments, many breweries and lumber mills. Other manufactures are articles of gold and silver, silk, porcelain, and carpets, cordials, chocolate, tobacco, leather, dyestuffs, astronomical instruments, chemicals, cobalt blue, stearine and sperm candles, and sailcloth.

Amsterdam's commercial importance has advanced rapidly since 1865. Since 1876 the short North Sea Canal has been in operation, running to an artificial harbor of 250 acres on the North Sea. The celebrated North Holland Canal has been supplanted by it for most of the sea traffic. Within the city much attention is paid to dredging and improvement of the canals centring to the north in the three islands, near which are the docks of the various steamship lines, that connect the city with all the great ports of the world. Here, too, are the naval docks and stores, a vast system of docks for merchant shipping, granaries, and railway terminals for the reception of coal and iron ore, raw materials, etc. Another canal connects Amsterdam with Utrecht. There is a floating dry-dock on the north bank of the Y for ships of 4000 tons and of 16 feet draught, while another dock of twice the size has been recently constructed. Amsterdam had need of such improvements, for her proportion of ships entering Holland was 18.8 in 1889, and 6.66 in 1899. In 1904 the total tonnage, entered and cleared, was 2,701,000.

The chief trade is with the Dutch East India colonies, and the imports are mainly tropical products, such as raw sugar, Java and Sumatra tobacco, coffee from Brazil and Java, tea, chemicals, drugs, lumber, and rice. Other articles of import are machinery and manufactured articles, wheat, glassware, and petroleum. In addition to the colonial products—coffee, tobacco, and rice—Amsterdam exports such Dutch products as cheese, beer, manufactured articles mentioned above, and drugs.

Amsterdam is the chief financial centre of the Netherlands, and her stock exchange is one of the most important in Europe. There are many other financial and commercial institutions, and the city is the seat of the Bank of the Netherlands, the successor of the famous Bank of Amsterdam, founded in 1609, which played so important a rôle in the history of banking, with a capital of $8,000,000, which has full control of all the country's paper money.

Amsterdam has a complete network of communications with the interior through railway and steamship lines, while various street-car routes, carried on by horse and electric power, traverse her streets. There is also a suburban steam railroad.

Amsterdam's new method of fortification merits some attention. In 1870 the old walls had all been razed, and since then a system of dikes and sluices has been devised whereby the surrounding country may be flooded; so that now there is only one fort, that at the entrance to the harbor.

Upward of one-fifth of the population of Amsterdam are Catholics, and the Jews form nearly one-ninth. There are, besides, many Germans. Population in 1879, 316,600; 1900, 510,900. On Dec. 31, 1904, the population was estimated at 551,415.

HISTORY. We first hear of Amsterdam in the thirteenth century, when the lords of Amstel had a castle there to protect the town, and when also the Dam which gives the town its name had already been built. The count of Holland, Floris V., gave the city free trade with his territories, and Amsterdam became part of the County of Holland in 1347. From now on the town increased rapidly, and, though devastated by fire in 1421, it was influential enough to obtain the right of bearing the imperial crown as its crest from Maximilian I. After the war for independence, when Antwerp succumbed to the Spaniards, Amsterdam became the chief commercial centre of the North; and after the foundation of the Dutch East and West India Companies, in the first quarter of the seventeenth century, with their headquarters in the city, it attained still greater prosperity. Even the wars with England in 1652-54 and 1665-67 did not for long check its progress. The decline of the city came in the latter part of the eighteenth century, as a result chiefly of the war with England of 1780-84, and the alliance with France. Its commerce disappeared entirely after it became a part of the French Empire in 1810, only to revive in the second half of the nineteenth century by the building of the great canals to the sea and to the Rhine system.

AMSTERDAM. A barren islet of volcanic origin, in the Indian Ocean, situated in lat. 37°

52′ S. and long. 77° 37′ E. It covers an area of 25 square miles, and, together with the adjacent island of St. Paul, forms a dependency of Mauritius. Both islands lie about midway between the Cape of Good Hope and Tasmania. It was discovered by Van Diemen in 1663.

AMSTERDAM. A city in Montgomery Co., New York, 33 miles by rail northwest of Albany; on the Mohawk River, the Erie Canal, and the New York Central and Hudson River and the West Shore railroads (Map: New York, F 3). Prominent features include Saint Mary's Catholic Institute, homes for aged women and children, and two hospitals. Amsterdam has factories producing knit goods, carpets, rugs, wagon springs, linseed oil, brooms, silk, paper boxes, etc. First settled about 1778 and known as Veedersburg until 1804, Amsterdam was incorporated as a village in 1830, and as a city in 1885. Pop., 1890, 17,336; 1900, 20,929; 1905, 23,943.

AMSTERDAM, UNIVERSITY OF. A Dutch university founded by the city in 1632 as the Athenæum Illustre. After a checkered existence it was reorganized in 1867, and in 1877 was raised to the dignity of a royal university, ranking with Leyden, Groningen, and Utrecht. It has an income of 329,000 florins, and over 1100 students. Its faculties include law, medicine, mathematics and science, arts, and theology. Its administration is in the hands of a 'Curatorium' of five members and a secretary, chosen by the crown. The professors form the Senate, with a Rector-Magnificus as their head, and a Secretary of the Senate. The library is large, and includes a number of special collections, particularly in Hebrew and in medicine.

AMU, ȧ-mo͞o′, or **AMU DARYA,** ȧ-mo͞o′ där′yȧ (ancient OXUS). A large river of Central Asia, which has its source in the Pamirs between India and Bokhara, flowing thence northwest into the Aral Sea. In its course through the mountains it is joined by the Surkhab from the region of the Alai and Trans-Alai Mountains, by the Kafirnahan and Surkhan from the Hazrot Sultan chain, and by numerous smaller streams, but after emerging from the outer slopes it receives no important tributaries. The Zerafshan on the north and the Murghab on the south, which formerly drained into the Amu, now lose their waters in the desert regions at some distance from its bed. It is navigable by light draught boats for nearly one-half of its total length of about 1600 miles, but its chief importance is as a reservoir for irrigation, rather than as a commercial highway. A remarkable feature of the Amu is that its course has been frequently changed within historic times. At the beginning of the present era it flowed into the Caspian Sea, and records show that since that time the course has been changed twice to the Aral Sea. As late as the first half of the sixteenth century, it was a feeder of the Caspian Sea. Consult Sir H. C. Rawlinson, "The Road to Merv," in the *Proceedings of the Royal Geographical Society*, new series 1. 161 (London, 1879); Krapotkin, "The Old Beds of the Amu-Daria," *Geographical Journal*, Volume XII. (London, 1898).

AMUCK′, or **AMOK′,** RUNNING (Javanese *amook*, to kill). A practice in Java among those in whom a ferocious madness is produced by long use of opium. The sufferer rushes abroad armed with some weapon, usually a *kris*, or large dirk, striking indiscriminately at all whom he encounters. When one is seen to start on his madness, the people cry "amok," and immediately hunt the maniac to death. Probably in many cases this is deliberate on the victim's part, as a means of suicide.

AM′ULET (Lat. *amuletum*, from Ar. *hamalet*, that which is suspended). Any object worn as a charm, or sometimes placed in a building to ward off evil. Amulets originated at an early date in the Orient, and regard for them is among the earliest superstitions of the Babylonians and Egyptians. The magical formulas connected with them are frequent in early Babylonian texts. Their religion included belief in a multitude of spirits present everywhere and influencing every act. Hence the necessity of preserving the house, property, and person by images and formulas, and these were from the beginning connected with medicine. Even the monotheistic Hebrews were not free from the taint, and the so-called *phylacteries*, with passages from sacred writ, were an adaptation of these magical beliefs. The Greeks and Romans inherited the same beliefs in a modified degree. Perhaps the most general evil to be guarded against by amulets at all times was the Evil Eye, which is still so firmly believed in throughout Latin countries. There were various classes of amulets. First came certain precious or other stones supposed to possess mysterious helpful properties: agates for spiders' and scorpions' stings, and for protection against thunderstorms; diamonds for melancholy; jasper for the tongue-tied and to bring on rain; amethyst against drunkenness, and, with certain inscriptions and figures, as antidotes to poisons, hail, and locusts, etc. One of the most permanent of all such beliefs is that in the beneficial effects of coral. Metals, also, and plants, were used as amulets. So were various parts of certain animals, such as hyena teeth or marrow, wolves' fat, rats' ears, foxes' tongues, and bats' heads. Most efficacious of all are the teeth of different animals. After these natural objects come artificial ones. A large proportion of ancient jewelers' work was undoubtedly made in connection with the wearing of amulets, especially necklaces, rings, bracelets, earrings, and other pendants. Other ways of carrying amulet material was in gold balls or *bullæ*, or in sachets. The formulas carried were usually inscribed, not on paper, but on some durable substance—metal, terra cotta, ivory, precious stones. Trinkets of every variety and shape—crescents, disks, pendants—were hung about the necks of children and adults as charms; and few went without them. Figures of gods and genii had magic virtue as well; so did verbal formulæ. (See ABRACADABRA, and ABRAXAS.) Many of such tiny images are found on necklaces. Anchors and horseshoes, heads and figures of animals, votive hands and feet, thunderbolts, vases, and many other objects, all had their specific values. The amulets not only were suspended around the neck, worn in jewelry, and sewed in the clothing, but also were affixed to furniture and walls, painted or carved on doors and walls, and buried in the ground. They even followed the deceased to his grave. Christianity was as unable as Judaism to eradicate the practice; so it sought to mitigate it by legislation and by offering devotional substitutes in the form of sacred relics or formulas from the Bible. These substitutes were carefully distinguished from the heathen amulets which the clergy were forbidden in the fourth century to make, under pain of deprivation of holy orders, and the wearing of which was solemnly condemned by a council in 721. But in the East the practice still flourishes, as well as in primitive parts of southern Europe. Consult: King, *History of Precious Stones and Gems* (London, 1873); and Wachsmuth in the *Athenæum* (Berlin), Volume II., pp. 209 foll.

AMUNDSEN, Ronald (1872—). A Norwegian explorer, born at Borje, Norway. He was educated for the naval service of Sweden-Norway, and became a second lieutenant. In 1901 he made observations on the East Greenland current which were considered valuable. He was permitted to join the *Belgica* expedition to the Antarctic in 1897-99, and was first officer of the ship throughout that expedition, which explored the region west of Graham Land. He sailed from Norway, June 17, 1903, in the ship *Gjoa*, and on December 5, 1905, the Government cable office at Seattle, Wash., received a message from him, announcing that he had determined the position of the magnetic pole, and had also located the northwest passage. See Polar Exploration.

AMUR, ȧ-mo͞or′. A province of eastern Siberia (q.v.), situated north of the River Amur; area, 174,427 square miles. It was ceded by China to Russia in 1858. The capital is Blagovyestchensk. Pop., 1891, 87,705; 1897, 120,306.

AMUR. A river of Asia, formed by the junction of the Shilka and Argun rivers, near the Russian village of Ust-Strielka, at the north end of the Khingan Mountains, lat. 53° 20′ N. and long. 121° 28′ E. (Map: Asia, N 4). From the point of junction of the two rivers the Amur flows at first east and then southeast along the northern boundary of Manchuria. At the eastern extremity of Manchuria it turns northward and near Fort Nicolayevsk, in lat. 53° 20′ N., it empties into the strait which separates the island of Saghalien from the mainland, near the point where that channel opens into the Sea of Okhotsk. Including its headstream of Argun, the Amur has a total length of nearly 2800 miles and its basin is estimated at about 750,000 square miles. The principal tributary of the Amur is the Sungari, which joins it on the right near the point at which the Amur begins its great bend toward the north. Another important affluent from the right is the Ussuri. The chief affluents on the left are the Seya and the Bureya. The river is very wide in the lower part of its course, and there are many islands in it. The great station of the steamers that navigate the Amur and the Ussuri is Khabarovsk (formerly called Khabarovka), which is connected by rail with Vladivostok. On the left bank of the Amur, near the parallel of 50°, is Blagovyestchensk, the capital of the Amur territory. A short distance below this town, on the opposite bank, is Aigun. The Amur is navigable for smaller vessels through its entire course, and steamers can ascend the Shilka beyond the town of Strietensk. The Amur is open for navigation only for about six months in the year. The region through which it flows is partly covered with thick forests, and but few settlements are found on its banks.

As early as 1636, several Russian adventurers, attracted by rumors of the wealth of the regions to the southeast of Lake Baikal, made excursions into the Chinese territories on the Lower Amur by way of the Shilka River. In 1649 Khabaroff descended the Amur, subdued the native tribes, and erected a number of forts at the junction of its tributaries. In 1658, Nertchinsk on the Shilka was founded, and about 1665 Fort Albasin was erected. The Chinese, who had watched the Russian advance with great uneasiness, now took up arms, attacked Fort Albasin repeatedly, and in the peace of Nertchinsk (1689) succeeded in closing the Amur to the Russians, who for more than one hundred and fifty years made no conquests in Manchuria, and contented themselves with extending their influence through commerce, missionary work, and diplomacy. With the appointment of Count Nicholas Muravieff to the governorship of East Siberia, active operations recommenced. A line of forts was constructed on the Amur, the coast of the Gulf of Tartary, and the island of Saghalien. In four expeditions undertaken in 1854 and subsequent years Muravieff established the authority of Russia over the Amur region, and some slight attempts were made at colonizing the country with Russian settlers. With the English and French marching upon Peking, China could not resist the Russian encroachments. The treaties of Aigun and Tien-tsin concluded in 1858, and the supplementary treaty of Peking in 1860, in ceding Eastern Manchuria to the Russians, merely gave formal recognition to an accomplished fact. By these treaties Russia obtained possession of all the country between the Pacific and the Amur, the Ussuri and the Tiumen rivers down to the Korean frontier. In this manner the long-desired goal of Russian foreign policy, an outlet and an ice-free port on the Pacific, was attained. The new territory was divided into two regions, the Amur Territory and the Maritime Province. In 1861, Vladivostok (q.v.), was founded; it became the chief military centre and arsenal of the Russians in the East, until supplanted after 1898 by Port Arthur (q.v.). During the Boxer uprising of 1900 the Chinese bombarded the town of Blagovyestchensk on the eastern bank of the Amur. This was followed by the Russian occupation of Manchuria (q.v.) and the chain of events leading to the Russo-Japanese War (q.v.). Consult: Collins, *Voyage down the Amoor* (New York, 1866); Andree, *Das Amurgebiet* (Leipzig, 1876).

AMURATH, ă′mo͞o-răt′, or **MURAD′ I.** (1319-89). Sultan of the Ottoman Empire from 1359 to 1389, succeeding his father Orkhan. He was the first to lead a powerful Turkish army into Europe, and in 1361 took Adrianople and fixed there his residence. He completed the subjugation of Asia Minor, and in 1389 his army dealt a crushing blow to the kingdom of Servia in a battle fought at Kossovo. The great Sultan himself was slain on the field of battle, stabbed, according to the common account, by a wounded Servian nobleman as he was surveying the scene of his victory. Amurath was illiterate, signing treaties by dipping his hand in ink and making a mark with three fingers together, with the fourth finger and thumb stretched wide apart.

AMURATH, or **MURAD II.** (1401-51). The tenth Sultan of the Turks. He succeeded his father, Mohammed I., in 1421. In 1422 he contended against a pretender, Mustapha (the legitimate Mustapha having previously died), but overcame him without bloodshed. He took Salonica from the Venetians in 1430, and opened the way for subjugating Greece. He went on successfully till 1442, when he was defeated by Hunyadi, and was obliged to make peace with the Christians. At that time he lost a son, and abdicated in favor of another son, Mohammed, only fourteen years old. The Hungarians renewed the war, and, hastening from retirement, he overwhelmed them in the battle of Varna, November 10, 1444, where Ladislas, King of Hungary and Poland, fell. He again retired, and again came forth to quell an insurrection of the Janissaries. He invaded Albania and was defeated by George Castriota (Scanderbeg); but he retired only to gain a great victory over his formidable adversary Hunyadi at Kossovo, in 1448. He was the first Ottoman monarch who caused bridges of great length to be built; and in his reign poetry, jurisprudence, and theology began to flourish. He died of apoplexy at Adrianople.

AMURATH, or **MURAD III.** (1545-95). A sultan of the Turks. He succeeded his father, Selim II., in 1574. He was a feeble, uxorious, superstitious man. His reign was marked by great reverses in Hungary, counterbalanced by territorial gains in Persia and Asia Minor. He made commercial treaties with the Western Powers, and was also the first to feel the tyranny of the Janissaries.

AMURATH, or **MURAD IV.** (1611-40). A sultan of the Turks. He succeeded his uncle, Mustapha, in 1623. He is known as "the Turkish Nero," and like his Roman namesake, he began his reign with great promise: but the mutinous behavior of his soldiers, and the frequent rebellions that marked the first years of his rule, made him a tyrant of extraordinary cruelty. His greatest exploit was the retaking of Bagdad from the Persians (1638), after an assault lasting thirty days, an occasion on which he slaughtered 30,000 of the inhabitants.

AMURATH V. (1840-1904), Sultan of Turkey. He was the son of Sultan Abd ul Medjid, and was born September 21, 1840. After the accession of his uncle, Abd ul Aziz, in 1861, he was kept in forced retirement, but was placed upon the throne by a revolution May 30, 1876. He showed strong symptoms of insanity, however, and was deposed August 31st of the same year.

AMUSSAT, ȧ'mụ'sȧ', JEAN ZULÉMA (1796-1856). A French surgeon. He entered the army, was assistant surgeon under Esquirol in the Salpêtrière Hospital, and prosector at the Paris faculty of medicine. He improved and invented many surgical instruments, and was the first to show the importance of torsion of arteries in hemorrhage. He wrote on the nervous system, lithotomy, etc. An operation for opening the large intestine at a point where it is not covered with peritoneum was perfected and first practiced by Amussat. It is still performed, and it bears his name. Among his publications are researches regarding the nervous system (1825), and a memoir on the torsion of arteries (1829), the latter winning a prize from the Institute.

AMY'CLÆ (Gk. *'Αμύκλαι, Amyklai*). (1) An ancient town of Laconia, on the eastern bank of the Eurotas, two and a half miles southeast of Sparta, in a richly wooded and fertile region. It was early a famous city, and after the Dorian conquest seems to have maintained its independence as an Achæan town until the development of the Spartan power. In the neighborhood of Amyclæ have been found important remains of Mycenæan civilization, including the gold cups of Vaphio. At Amyclæ was an ancient temple of Apollo, containing a primitive bronze image of the god (*xoanon*), standing on an elaborate bronze throne. It was the work of Bathycles. Pausanias has given a description of it, important in the history of early Ionic art. At Amyclæ were celebrated annually the Hyacinthia, in memory of Hyacinthus (q.v.). (2) AMYCLÆ, or Amuclæ, an ancient city on the coast of Latium, Italy, said to have been built by a colony from the Greek Amyclæ. It had ceased to exist before the time of Varro.

AMYG'DALIN (Lat. *amygdala*, Gk. *ἀμυγδάλη, amygdalē*, almond), $C_{20}H_{27}NO_{11}$, $3H_2O$. A crystalline substance existing in the kernel of bitter almonds and in various other plants. It is obtained, by extraction with boiling alcohol, from the paste of bitter almonds, which remains after the fixed oil has been separated by pressure. The alcoholic solution usually contains more or less oil, which must be removed by decantation or filtration; it is then evaporated till a syrup is left, from which the amygdalin may be obtained by the addition of ether; amygdalin is insoluble in ether, and is, therefore, precipitated by it from its solutions. Amygdalin has a somewhat bitter taste, but is not poisonous. It may be dissolved in water for any length of time without undergoing any change; but if some emulsine (or some dilute mineral acid) be added to the solution, a sort of fermentation is set up, and the amygdalin gradually undergoes decomposition into oil of bitter almonds, sugar, and hydrocyanic or prussic acid. Now, as emulsine, too, is one of the constituents of bitter almonds, when the paste of bitter almonds is brought into contact with water, a poisonous liquid is obtained.

AMYG'DALOID (Gk. *ἀμυγδάλη, amygdalē*, almond + *εἶδος, eidos*, shape). A name given in geology to igneous rocks, generally of a basaltic nature, which contain numerous almond-shaped or spheroidal cavities filled with foreign minerals, such as quartz, calcite, or some one of the zeolites. These cavities are regarded as the result of the escape of gases when the rocks cooled, at which time the crystallization of the minerals also took place, these being for the most part similar in composition to the rock.

AM'YL (Lat. *amylum*, from Gk. *ἄμυλον, amylon*, starch + *ὕλη, hylē*, material), C_5H_{11}. A radicle, or group of atoms, found in the molecules of many organic compounds, but incapable of existing independently. See CARBON COMPOUNDS.

AMYL AL'COHOL. A name applied to eight alcohols having the same molecular composition ($C_5H_{11}OH$), but more or less different chemical and physical properties. Seven of these alcohols have actually been prepared; the possibility of the existence of the eighth is indicated by the structural theory of compounds. The most important amyl alcohols are the two found in fusel oil, which is produced as an impurity during alcoholic fermentation. (See ALCOHOLS.) Of these, one is called iso-butyl-carbinol, $(CH_3)_2CH.CH_2.CH_2OH$; the other, secondary butyl-carbinol, $CH_3.CH_2CH(CH_3).CH_2OH$. Iso-butyl-carbinol boils at 131° C., has a specific gravity of 0.810, and is optically inactive; it forms the predominating constituent of fusel oil. Secondary butyl-carbinol boils at 128° C., and imparts to fusel oil, of which it forms 10 to 20 per cent., the property of turning the plane of polarized light to the left. The separation of the two is a matter of some difficulty. It may, however, be effected by treating the mixture with hydrochloric acid: iso-butyl-carbinol is more readily attacked by the acid than secondary butyl-carbinol; it is, therefore, the first to be converted into the corresponding chloride, $C_5H_{11}Cl$, the separation of which from the unattacked secondary butyl alcohol can be effected by ordinary laboratory methods. A third amyl alcohol, known as amylene hydrate, or di-methyl-ethyl-carbinol, and having the constitutional formula $(CH_3)_2C_2H_5COH$, is a colorless liquid, with a penetrating and pungent odor and an unpleasant taste. When taken internally in moderate doses it acts as a hypnotic; in larger doses it is liable to cause narcotic symptoms. The esters (compound ethers), formed by the union of amyl alcohols with some of the acids of the acetic acid series, have highly aromatic odors, resembling those of the apple, the pineapple, the strawberry, the banana, and other fruits. Fusel oil is therefore used in making artificial fruit essences, which are now generally employed for flavoring syrups, confectionery, etc.

AM'YLENE HY'DRATE. See AMYL ALCOHOL.

AM'YL NI'TRITE. An extremely volatile, pale yellow, oily liquid, with an aromatic taste and an odor resembling bananas. It is formed by the action of nitric acid upon amyl alcohol (fusel oil). As it rapidly deteriorates, it is necessarily kept in "small, dark, amber-colored and glass-stoppered vials, in a cool and dark place, remote from lights." The last precaution is due to its inflammable nature. The drug is also put into closed glass capsules, commonly known as "pearls," which are so fragile that they can be crushed in a handkerchief when desired for use. Though occasionally administered internally, it is usually given by inhalation. A moderate amount inhaled causes almost immediately flushing of the face, a feeling of fullness and pain in the head, rapid and strong heart action, labored breathing, and a very soft and full pulse. If continued, the head seems distended as though it would burst, and the other symptoms increase. Within a few minutes all these symptoms disappear. Poisonous doses cause pallor, irregular breathing, muscular relaxation, and death. Xanthopsia, or yellow vision, sometimes follows inhalation of amyl nitrite, but within a few minutes objects gradually resume their natural colors. Besides the marked diminution of arterial tension, the drug causes a change in the blood, with the formation of what appears to be hæmoglobin. The chief use of amyl nitrite is to relieve the attacks of angina pectoris. It is also valuable for aborting epileptic seizures, especially when there is an aura, or peculiar sensation denoting the approach of one of these. In spasmodic conditions, such as asthma, tetanus, or strychnine poisoning, it is used, and also as a rapidly acting heart-stimulant. See NITROGLYCERIN.

AMYN'TAS I. (Gk. Ἀμύντας) (c. 498 B.C.). King of Macedonia from about 540 to 498 B.C. In token of submission to the Persians, he presented earth and water to the ambassador, Megabazus, whom Darius, on his return from the Scythian expedition, had left at the head of 80,000 men in Europe.

AMYNTAS II. King of Macedonia from about 394 to 369 B.C., son of Philip, the brother of Perdiccas II. He succeeded his father in Upper Macedonia, and obtained the crown of the entire country by the murder of the usurper, Pausanias (393 B.C.). Soon after his accession he was driven from Macedonia by the Illyrians, but by the aid of the Thessalians was restored to his kingdom. Afterward he entered into an alliance with the Spartans. He left three sons, Alexander, Perdiccas, and Philip the Great.

AMYNTAS III. (?-336 B.C.). Grandson of Amyntas II., son of Perdiccas. On the death of his father, in 360 B.C., he was the lawful heir to the throne, which was usurped by his uncle, Philip. He was put to death in the first year of the reign of Alexander the Great (336 B.C.), who charged him with having conspired against his life.

AMYNTOR, GERHARD VON. A German writer. See GERHARDT, DAGOBERT VON.

AMYOT, ȧ'myō', JACQUES (1513-93). Tutor of King Charles IX., of France, Bishop of Auxerre, and Commander of the Order of the Holy Ghost, born at Melun, and remembered chiefly for his translations of the Greek romances, *Theagenes and Chariclea* (1546), and *Daphnis and Chloë* (1559), together with *Diodorus Siculus* (1554), *Plutarch's Lives* (1559), and *Plutarch's Morals* (1572). This Plutarch was the basis of North's English version (1575) used by Shakespeare. It was used by Corneille, and ranks with Amyot's other translations among French classics.

AMYOT, ȧ'myō', or **AMIOT,** JOSEPH (1718-94). A celebrated French Jesuit and Oriental scholar. He lived as a missionary in China from 1750 to the time of his death. His knowledge of Chinese languages enabled him to collect many valuable notices of antiquities, history, language, and arts in China. His writings include large contributions to the *Mémoires concernant l'histoire, les sciences et les arts des Chinois* (1776-1814). His *Dictionnaire Tatar-Mantchou-François* (1789-90) was edited by Langlès.

AM'YRAL'DISM. See AMYRAUT.

AMYRAUT, ȧ'mē'rō', MOÏSE. (1596-1664). A French Protestant theologian and metaphysician. He was born at Bourgueil, near Tours. His father set him to study law, and he made rapid progress in the University of Poitiers. He became a licentiate in law (1616), but the reading of Calvin's *Institutes* induced him to leave law for theology, and he studied at Saumur, and "sat at the feet of the great Cameron," a pupil as great as his master. There he became a pastor in 1626; in 1633 professor of theology. He was co-professor with Louis Capel and Josua de la Place. Their life-long friendship was beautiful and remarkable, as is their memory as joint authors of the *Theses Salmuriensis.* In 1631 Amyraut published *Traité des religions* (Saumur), still a living work; and thenceforward he was foremost in provincial and national synods. The esteem in which he was held was shown when the Charenton synod of 1631 chose him to present to the King the *Copy of the Complaints and Grievances for the Infractions and Violations of* *the Edict of Nantes.* Before this time all save Roman Catholic deputies had addressed the King on their knees; but Amyraut refused to speak unless he could stand as did the Romanists, and carried the day, his rehearsal charming even his adversaries. His oration is an historic landmark of French Protestantism. He held fast to Calvinism, but with an unusual liberality. He was repeatedly accused, but never convicted, of heresy, because in his *Traité de la prédestination* (1634) he advocates a modification of the strong predestination theory of the Synod of Dort by the "Universalismus hypotheticus," i.e., the theory that God offers salvation to all under the conditions of faith. This is known as Amyraldism, and found many adherents—among them Baxter, Andrew Fuller, and the New England divines. He died at Saumur, January 8, 1664. He left many religious works.

AN, or **ON**. The Egyptian name of Heliopolis (q.v.).

A'NA. A termination added to the names of remarkable men, to designate collections of their sayings, anecdotes, etc.; as in the works entitled *Baconiana, Johnsoniana.* Such titles were first used in France, where they became common after the publication of *Scaligerana* by the brothers Dupuy (The Hague, 1666). In English literature there are many works of this kind. America, also, has its *Washingtoniana*, and Jefferson's *Anas* are well known to students of our history.

AN'ABAP'TISTS (Gk. *ἀναβαπτίζειν, anabaptizein*, to rebaptize). A term applied generally in Reformation times to those Christians who rejected infant baptism and administered the rite only to adults; so that when a new member joined them, he or she was baptized, the rite as administered in infancy being considered no baptism. Still, because all other branches of the church considered this a *second* baptism, the term *Anabaptist*, i.e., one who baptizes *again*, was naturally applied to them. The name is, however, not now used by the present Baptists.

The primitive baptism was doubtless of adults only, but infant baptism early became the Church practice. Opposition to it was kept up by a number of minor and obscure sects in the Middle Ages. When the Reformation unshackled the popular mind it came into prominence. Unfortunately, it was linked with other unpopular ideas of a revolutionary character, and adopted by a set of fanatical enthusiasts called the prophets of Zwickau, in Saxony, at whose head were Thomas Münzer (q.v.) (1520) and others. Münzer went to Waldshut, on the borders of Switzerland, which soon became a chief seat of Anabaptism, and a centre whence visionaries and fanatics spread over Switzerland. They pretended to new revelations, dreamed of the establishment of the kingdom of heaven on earth, and summoned princes to join them, on pain of losing their temporal power. They rejected infant baptism, and taught that those who joined them must be baptized anew with the baptism of the Spirit; they also proclaimed the community of goods, and the equality of all Christians. These doctrines naturally fell in with and supported the "Peasant War" (q.v.) that had about that time (1525) broken out from real causes of oppression. The sect spread rapidly through Westphalia, Holstein, and the Netherlands, in spite of the severest persecutions. The battle of Frankenhausen (see MÜNZER) crushed their progress in Saxony and Franconia. Still scattered adherents of the doctrines continued, and were again brought together in various places by traveling preachers. In this capacity Melchior Hoffmann, a furrier of Swabia, distinguished himself, who appeared as a visionary preacher in Kiel in 1527, and in Emden in 1528. In the last town he installed a baker, John Matthiesen, of Haarlem, as bishop, and then went to Strassburg, where he died in prison. Matthiesen began to send out apostles of the new doctrine. Two of these went to Münster, where they found fanatical coadjutors in the Protestant minister Rothmann, and the burghers Knipperdolling and Krechting, and were shortly joined by the tailor Bockhold, of Leyden, and Gerrit Kippenbrock, of Amsterdam, a bookbinder, and at last by Matthiesen himself. With their adherents they soon made themselves masters of the city; Matthiesen set up as a prophet, and when he lost his life in a sally against the Bishop of Münster, who was besieging the town, Bockhold and Knipperdolling took his place. The churches were now destroyed, and twelve judges were appointed over the tribes, as among the Israelites; and Bockhold (1534) had himself crowned king of the "New Sion," under the name of John of Leyden. The Anabaptist madness in Münster now went beyond all bounds. The city became the scene of the wildest licentiousness, until several Protestant princes, uniting with the bishop, took the place, and by executing the leaders put an end to the new kingdom (1535).

But the principles disseminated by the fanatical Anabaptists were not so easily obliterated. As early as 1533 the adherents of the sect had been driven from Emden and taken refuge in the Netherlands, and in Amsterdam the doctrine took root and spread. Bockhold also had sent out apostles, some of whom had given up the wild fanaticism of their master; they let alone the community of goods and women, and taught the other doctrines of the Anabaptists, and the establishment of a new kingdom of pure Christians. They grounded their doctrines chiefly on the Apocalypse. One of the most distinguished of this class was David Joris, a glass painter of Delft (1501-56). Joris united liberalism with Anabaptism, devoted himself to mystic theology, and sought to effect a union of parties. He acquired many adherents, who studied his book of miracles (*Wunderbuch*), which appeared at Deventer in 1542, and looked upon him as a sort of new Messiah. Being persecuted, he withdrew from his party, lived inoffensively at Basel, under the name of John of Bruges, and died there in the communion of the Reformed Church. It was only in 1559, when his heretical doctrines had come to light, that the council of Basel had the bones of Joris dug up and burned under the gallows.

Contemporary with these fanatical Anabaptists there were those who united denial of the validity of infant baptism with mystical views, and even with denial of the deity of Christ. But in Switzerland and South Germany the Antipædo-Baptists, who date from 1523, and were dominated by the theological views of Balthazar Hubmeier, though reckoned with the other Anabaptists and cruelly persecuted and suppressed, held only at worst defective political views, but had no part or parcel with any immoral practices. Their creed can be learned from Zwingli's attack upon them. See the English translation in Jackson's *Selections from Zwingli*, pp. 123-258 (New York, 1901). This humble folk were treated like criminals, because the authorities recognized that their principles, though in no way sinful, were subversive of the tyrannical government they exercised. Anabaptists must die because they would not submit to the established order. To this day the advocates of the State Church look askance at them. At first among them the mode of baptism was not considered important, and so not much discussed. It was by pouring or sprinkling.

A new era for the Anabaptists begins with Menno Simons. (See MENNO.) Surrounded by dangers, Menno succeeded, by prudent zeal, in collecting the scattered adherents of the sect, and in founding congregations in the Netherlands and in various parts of Germany. He called the members of the community "God's congregation, poor, unarmed Christians, brothers;" later, they took the name of Mennonites, and at present they call themselves, in Germany, Taufgesinnte; in Holland, Doopsgezinden—corresponding very nearly to the English designation Baptists. This, besides being a more appropriate designation, avoids offensive association with the early Anabaptists. Menno expounded his principles in his *Elements of the True Christian Faith* in Dutch. This book is still an authority among the body, who lay particular stress on receiving the doctrines of the Scripture with simple faith, and acting strictly up to them, setting no value on learning and the scientific elaboration of doctrines. They reject the taking of oaths, war, every kind of revenge, divorce (except for adultery), infant baptism, and the undertaking of the office of magistrate; magistracy they hold to be an institution necessary for the present, but foreign to the kingdom of Christ; the Church is the community of the saints, which must be kept pure by strict discipline. With regard to grace, they hold it to be designed for all, and their views of the Lord's Supper fall in with those of Zwingli; in its celebration the rite of feet-washing is retained. In Germany, Switzerland, and Alsace their form of worship differs little from the Lutheran. Their bishops, elders, and teachers serve without pay. Children receive their name at birth, baptism is performed in the place of worship, and adults that join the sect are rebaptized. (See MENNONITES.)

Almost the only split among the early Continental Baptists on doctrinal grounds was that which took place in Amsterdam in 1664. Arminianism had not been without its influence, especially among the Waterländers, originally more liberal in their views. A leading congregation accordingly divided into two parties, one (Galenists, from Galenus, their leader) advocating freer views in doctrine and discipline; the other (Apostoolists, from Samuel Apostool) adhering to absolute predestination and the discipline of Menno. The liberal party rejected creeds as of human invention, adopted much of the philosophy and theology of England, and exercised no little influence on the intellectual progress of Holland. These two parties gradually absorbed the other sections of the Baptists in the Netherlands; and about the beginning of the nineteenth century a union took place by which all the congregations now belong to one body.

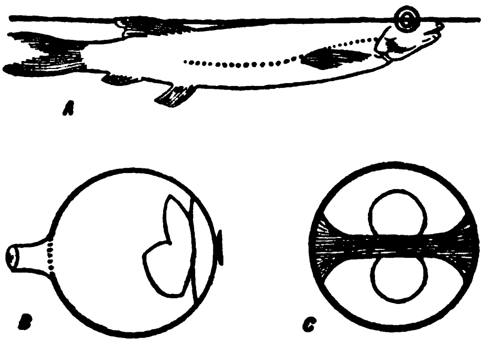
For the modern denomination called Baptists, which continues the same protest against infant baptism, but has little, or, as some claim, no genetic connection with the Anabaptists, see BAPTISTS.

ANABARA, ȧ-nä'bȧ-rä'. A river in Siberia, emptying into the Arctic Ocean (Map: Asia, L 1), and forming the boundary between the government of Yeniseisk and the territory of Yakutsk.

A'NABAS, AN'ABAT'IDÆ. See CLIMBING FISH.

ANAB'ASIS (Gk. *ἀνάβασις*, from *ἀνά*, *ana*, up + *βαίνειν*, *bainein*, to go). The name of two historical works. (1.) The *Anabasis of Cyrus*, written by Xenophon early in the fourth century B.C., which gives a narrative of the unfortunate expedition of the younger Cyrus against his brother, the Persian King Artaxerxes, and of the retreat of his 10,000 Greek allies under the command of Xenophon. (2.) The *Anabasis of Alexander*, written by Arrian 166-168 A.D., and giving an account of the campaigns of Alexander the Great.

AN'ABLEPS (Gk. *ἀναβλέπειν*, *anablepein*, to look up). A genus of cyprinodont fishes, the four-eyes, remarkable for the incomplete division of the eye into an upper smaller and a lower larger part. This division is effected by the growth of two processes of the iris toward each other across the pupil, and a corresponding band of the conjunctiva across the cornea. As they are surface fish, and swim with their eyes partly projecting above the water, the upper part serves the purpose of seeing in the air and the lower for seeing in the water. They occur in shallow water along the coast, and in the rivers of tropical America.



ANABLEPS TETRAOPHTHALMUS.

A. Attitude in swimming. B. Vertical section of the eye through the lens, showing the lenticular form of the upper half receiving light through the air, and the suborbicular shape of the lower half receiving light through water. C. Diagram of the eye across the front, showing external dark band. (After Tegetmeier.)

ANAB'OLISM (Gk. *ἀναβολή*, *anabolē*, something heaped up), and CONSTRUCTIVE METABOLISM. Terms applied to the chemical processes of the living body, which result in the formation of more complex compounds from simpler ones. See METABOLISM.

ANAB'RUS. See LOCUST.

ANACAONA, ä'nȧ-kä'ō-nȧ, or GOLDEN FLOWER. An Indian princess, sister and wife respectively of Behechio and of Caonabo, caciques of Haiti when Columbus discovered the island

(1492). She succeeded her brother as ruler of his tribe, and after the death of Caonabo was on friendly terms with the Spanish until 1503. In the latter year she gave a feast in honor of Ovando, the Spanish governor, but in the midst of the festivities was arrested and put to death by his order.

AN'ACAR'DIA'CEÆ (Gk. *ἀνά*, *ana*, [like] unto + *καρδία*, *kardia*, heart), Sumach Family. An order of dicotyledonous plants consisting mostly of trees and shrubs, with acrid, resinous, or milky sap, in some instances very irritating and poisonous. The leaves are usually alternate, rarely opposite; flowers small, polygamous, diœcious or perfect; calyx small, usually five-parted; petals of the same number as the sepals; stamens as numerous as the petals and opposite them, or twice as many, rarely fewer; ovaries of the staminate flowers one-celled, of the pistillate flowers three to seven-celled, with a single ovule in each cell; fruit generally a drupe; seeds bony, endosperm little or none; cotyledons fleshy. This family embraces about 50 genera and 500 species, most of which occur in the tropics of both hemispheres, the only prominent genus indigenous to the United States being Rhus; the Sumach and Poison oak (q.v.). The genera of the family are grouped into a number of sections, the more important of which are: Mangiferæ, of which Mangifera and Anacardium are the principal genera; Spondieæ, represented by Spondias; Rhoideæ, the chief genera of which are Pistacia, Rhus, Cotinus, and Schinus; and Semecarpeæ, represented by Semecarpus. The entire order abounds in resins and tannins, furnishing the source whence some of the most valuable lacquers, varnishes, and tanning materials are obtained, while some species produce wholesome and pleasant fruits, some of which are extensively grown in the tropics. For detailed economic descriptions, see Cashew Nut; Pistacia; Mastic; Hog Plum; Poisonous Plants; Mango; Sumach, and other names mentioned above.

AN'ACAR'DIUM. See Cashew Nut.

ANACHARIS, ȧ-năk'ȧ-rĭs (Neo-Lat. from Gk. *ἀνά*, *ana*, up + *χάρις*, *charis*, grace). An aquatic plant (*Anacharis Canadensis*), native of North America, where it grows entirely submerged in the water of ponds and slow-flowing streams. The plant is a much-branched perennial, with long, slender stems that bear numerous small sessile, linear-oblong leaves arranged either in whorls or oppositely upon the axis. The small flowers appear upon the surface of the water for a short period of time sufficient for pollination, after the accomplishment of which act the female flowers are withdrawn beneath the surface; a case similar to that in the eel-grass (Vallisneria, q.v.). This plant was introduced into Great Britain about 1842, and because of its rapid growth has become a serious obstacle to navigation in many of the tide water streams. Anacharis is a good example of a plant, innocuous in its native country, which has been introduced elsewhere, and found there such congenial habitat as to enable it to become a most obnoxious weed. It is also known as Elodea Canadensis.

ANACHARSIS, ăn'ȧ-kär'sĭs (Gk. *ʼΑνάχαρσις*). A Scythian, the brother of King Saulius, said by Plutarch and Diogenes Laërtius to have visited Solon at Athens, to have lived with him on terms of intimacy, and also to have been initiated into the Mysteries. From the early fourth century B.C., the tendency to idealize the barbarian peoples of the North assigned to him the highest qualities; his love of learning is said to have caused him to travel through many lands; he was numbered among the Seven Wise Men; and from Aristotle's time many wise sayings and proverbs were attributed to him. They are edited by Mullach, *Philosophorum Græcorum Fragmenta* (Paris, 1860-81). Under the title *Voyage du jeune Anacharsis en Grèce*, Jean Jacques Barthélemy, a well-known French author (q.v.), wrote in 1789 a description of Greek life and manners, displaying learning and good taste, but disfigured by many anachronisms. Anacharsis is made to visit Athens only a few years before the birth of Alexander the Great, and the features of several distinct periods in Grecian history are confusedly regarded as having been contemporaneous. The book, therefore, will not bear a critical examination; but it has contributed its share toward an improved knowledge of ancient life, and has given rise to several similar works, such as the *Gallus* and the *Charicles* of Becker.

ANACHARSIS CLOOTS. See Cloots.

ANACH'RONISM (Gk. *ἀναχρονίζεσθαι*, *anachronizesthai*, to refer to wrong time, from *ἀνά*, *ana*, back, against + *χρόνος*, *chronos*, time). An error in chronology. Sometimes an anachronism is purposely made for the sake of effect, or to bring certain events within convenient compass for dramatic purposes. Shakespeare, in his *Julius Cæsar*, makes the "clock" strike three; and Schiller, in his *Piccolomini*, speaks of a "lightning-conductor" as known a hundred and fifty years before its invention. These discrepancies, however, do not seriously injure the general truth of a poetical work. The anachronism is more offensive when, in a work which pedantically adheres to the costumes and other external features of old times, we find a modern style of thought and language, as in the old French dramas of Corneille and Racine. In popular epic poetry anachronism is a common feature. Achilles is always young; Helena, always beautiful. In their versions of old classic traditions, the writers of the Middle Ages converted Alexander, Æneas, and other ancient heroes into good Christian knights of the twelfth century. In the *Nibelungenlied*, Attila and Theodoric are good friends and allies, though the latter began to reign some forty years after the former. At the end of the poem, the heroine, who must have been nearly sixty years old, and had passed through great affliction and sorrow, is still the "beautiful Queen Kriemhild." Many ludicrous examples of anachronism may be found in old Dutch paintings; e.g., Abraham, Isaac, and Jacob in modern costumes, and Adam in Paradise armed with a musket.

ANACHUANA, ä-nä-choo-ä-nä. A village and bay, on the northern coast of the Isthmus of Panama.

AN'ACLE'TUS I., Saint, otherwise Cletus. Second or third bishop of Rome. A martyr under Domitian. Others say that he succeeded Clement I. as fifth bishop of Rome, and was martyred under Trajan. His day is July 13th.

ANACLETUS II. (?—1138). Anti-pope, by name Peter Pierleoni. He sprang from a rich and powerful Roman Jewish family, studied in Paris, became cardinal in 1116, was chosen Pope in 1130 by a faction of cardinals opposed to Innocent II., and was sustained by the Roman and some other States. He maintained himself at Rome against the arms of Lothaire, the opposition of other kings, and the clergy in general. He died January 25, 1138.

AN'ACOLU'THON (Gk. *ἀν*, *an*, priv.+ *ἀκόλουθος*, *akolouthos*, following, attending). A term employed both in grammar and in rhetoric to denote the absence of strict logical sequence in the grammatical construction. In colloquial speech, nothing is more common than anacoluthon; but careful writers shun it. The following from Disraeli illustrates the term: "*Lost* in profound reverie, *the hours* flew on."

AN'ACON'DA (Origin unknown; possibly native name). Any large crushing snake, a boa. More especially the great South American water-boa (*Eunectes murinus*), called in Brazil Sucuriu, which is closely allied to the boa constrictor, and is sometimes 30 feet long. Its nostrils are capable of being closed while in the water. It haunts the banks of streams in Guiana and Brazil, where it preys on the animals that live in the water or come to the banks to drink. When on land it is rather helpless. It is rich brown, beautifully decorated by a double series of dorsal blotches and with irregular ring-spots along the sides. Consult Molls and Ulrich, *Proceedings Zoölogical Society of London* (1894). See Boa, and plate of Boas.

ANACONDA. A city and county seat of Deer Lodge Co., Mont., 26 miles west by north of Butte, on the Butte, Anaconda and Pacific and the Northern Pacific railroads (Map: Montana, C 2). It has parks, driving park grounds, the Hearst Free Library of about 7000 volumes, and two commodious opera houses. Deposits of graphite, gold, and sapphires are found in the vicinity, and the city is noted for its copper-smelting works, which are among the largest in the world, having a daily capacity of some 8500 tons of ore. Railroad shops, foundries, machine shops, and brick works further represent the industrial interests. Founded in 1884, when the reduction works were established, Anaconda has developed with the copper industry. Pop., 1900, 9453; 1905 (local est.), 15,275.

ANA'CREON (Gk. *'Ανακρέων*, *Anakreōn*) (561-476 B.C.). One of the most esteemed lyric poets of Greece. He was born at Teos, a seaport of Ionia, and spent part of his youth in Abdera, to which place most of his fellow-townsmen emigrated when their city was taken by the Persians in 545 B.C. He was patronized by Polycrates, the ruler of Samos (533-522), who invited him to his court; and there he sang in light and flowing strains the praise of wine and love. After the death of Polycrates, he went to Athens (521 B.C.) and was received with distinguished honor by Hipparchus. After the fall of Hipparchus, he accepted an invitation from Echecrates, a Thessalian prince, to make his home with him. He died in 476 B.C., at the age of eighty-five. Great honors were paid to him after his death. Teos put his likeness upon its coins, and Pausanias saw a statue to him on the Acropolis of Athens, which represented him in a half-drunken condition. The Alexandrians knew five books of his poems; but we have only two poems complete, and a few scanty fragments. The collection of poems known as Anacreontics are weak imitations of his work, dating from the Alexandrine period to late Byzantine times. The genuine fragments are published in Bergk's *Poetæ Lyrici Græci* (fifth edition Volume III., Leipzig, 1900). They have been paraphrased in English by Thomas Moore.

AN'ACYC'LUS. See Pellitory of Spain.

ANADIR, ä'nȧ-dĭr', or Anadyr Bay. A sea or large gulf of northeastern Asia, constituting the northwestern part of Bering Sea (Map: Asia, Siberia, R 2). It is about 480 miles in circumference and about 250 miles wide. It is frequented by whalers.

ANADIR. A river in the extreme northeast of Siberia, rising in the mountain-lake Ivashkino, and flowing, first in a southwesterly, and then in an easterly, direction, mostly through rocky, snowy regions, for a distance of about 300 miles, and emptying itself into the gulf of the same name, in lat. 64° 40′ N. It drains an area of about 115,000 square miles. Its principal tributaries are the Mayin, the Bielaya, and the Krasnaya. Consult Krahmer, "Der Anadyr-Bezirk nach A. W. Olssufjew," in Volume XLV. *Petermann's Mitteilungen* (Gotha, 1879).

AN'ADYOM'ENE (Gk. *ἀναδυομένη*, from *ἀναδύεσθαι*, *anadyesthai*, to rise). A name applied to Aphrodite emerging from the sea. The ancients used the word to denote a celebrated painting by Apelles (q.v.), representing the goddess at this moment. It was painted for the temple of Asclepius on the island of Cos. Augustus bought it for a hundred talents of remitted taxes, and placed it in the temple of Julius Cæsar. It is frequently mentioned in the Greek Anthology, but the allusions do not furnish the data for accurate reconstruction of the painting. The name is frequently applied to similar representations of Aphrodite rising from the waves or standing in a shell and wringing the water from her hair.

ANADYR, ä'nȧ-dĭr'. See Anadir.

ANÆ'MIA (Gk. *ἀν*, *an*, priv. + *αἷμα*, *haima*, blood). The condition generally termed poverty of blood. In medicine two distinct kinds of anæmia are recognized—*primary* and *secondary*. *Primary anæmia*, or *pernicious anæmia*, is a rare, generally fatal disease of the blood-making organs, notably either of the spleen, the marrow of the long bones, or of the lymph glands. Its cause is unknown. The chief changes consist in a marked reduction of the number of the red-blood cells, a diminution in the percentage of the hæmoglobin, and changes in the heart, liver, and blood-making organs. There is usually great pallor, shortness of breath, weakness, and palpitation of the heart. *Secondary anæmia* is a symptom found in many diseases and conditions, as malaria, hemorrhage, jaundice, poisoning by lead, mercury, copper, or arsenic; further, it may be due to improper food, insufficient sunlight, or animal parasites; or, finally, it may occur during Bright's disease (q.v.), diabetes (q.v.), or cancer. The symptoms are similar but less severe. The curative treatment of the secondary anæmias consists in allowing the patient fresh air, good nourishment, and materials which promote the formation of the deficient elements of the blood, such as iron and arsenic. See Chlorosis. For "Miners' Anæmia," see Ankylostomiasis.

AN'ÆSTHE'SIA (Gk. *ἀν*, *an*, priv. + *αἴσϑησις* *aisthēsis*, feeling, sensibility, or ANALGESIA). A loss of sensibility to external impression. Anæsthesia means, properly, the loss of the sense of touch; analgesia, the loss of the sense of pain. The terms are often used interchangeably, and anæsthesia has come to mean the loss of sensibility to all kinds of sensory impressions. Tactile, pain, heat, cold, and muscular senses are those usually affected. All these sensations are received by special sense organs situated on the outside of the body or in mucous membranes. From the sensory end organs the paths for these sensations pass into the spinal cord, and thence up to more or less distinct areas of the brain. Disease or injury in any part of the path may produce a loss of these sensations. Thus, if a nerve which contains sensory fibres is injured, the parts whose sensory nerves are detached from the brain lose all sensibility. In certain diseases of the spinal cord the sensory fibres are affected, and all parts below the site of the morbid process lose their sensibility. In a certain rare disease (syringomyelia), there is loss of pain sense and of the sense of heat and cold, but not of tactile sense. Should accident or disease occur still higher up in the sensory area of the brain, or in areas where sensory fibres come together, as in the medulla and internal capsule, one side of the entire body may become anæsthetic. Such extreme grades of anæsthesia are infrequent, but there is almost no area in the body which may not lose its sensibility by accident or disease. Even in "functional" diseases, as hysteria, in which no known changes have taken place in the nervous tissues, loss of sensibility may occur. Consult Patten, *Anæsthesia and Anæsthetics, General and Local* (Chicago, 1903). See ANÆSTHETIC; SENSATION.

AN'ÆSTHET'IC (for derivation, see ANÆSTHESIA). Any remedy used to relieve pain or other hyperæsthetic conditions of the sensory nerves. Those that relieve pain alone are frequently termed analgesics. The broader term is used indiscriminately, including two great groups of anæsthetics: (1) Local anæsthetics, affecting a restricted area; (2) general anæsthetics, temporarily affecting the sensibility of the entire body. Cold is one of the safest local anæsthetics, in the form of cold water or cracked ice. Various freezing mixtures, such as ether spray or ethyl chloride spray, are even more valuable, but require skill and experience in use, or the part may be frozen and thus injured. Carbolic acid and its allies, creosote, thymol, and other volatile oils, containing phenol-like bodies, are powerful anæsthetics. These, when applied locally, have the power of paralyzing the sense organs of the skin and mucous membranes. Their use is attended with danger, however, and should be administered by a physician only. The most important of the local anæsthetics is cocaine (q.v.), which has the peculiar and useful property of being able to paralyze sensory nerves alone. In a weak solution, it is injected under the skin, which it renders anæsthetic, relieving pain, as in neuralgia, and permitting operations on the part. Applied to the mucous membrane, it destroys all feeling, and can be used in the eye, ear, nose, mouth, rectum, vagina, urethra, and bladder, 'to overcome pain or permit operations. Dr. J. Leonard Corning, of New York, in 1885, discovered that when injected in weak solution into the spinal canal, it produced a loss of all sensation below the place of injection. Extensive operations have been performed under cocaine, and children have been born without pain to the mother; but there are some serious disadvantages in this medullary narcosis. Eucaine, holocaine, and orthoform have been used for the same purpose as cocaine.

It is probable that for thousands of years the natives of India have used Indian hemp for the relief of pain, while the inhabitants of China have used opium from the poppy plant. In all ages and among all peoples, as far back as history records, people have used alcoholic drinks to produce diminished sensibility to pain. Within recent years the pharmaceutical chemist has been industrious in making new compounds to relieve pain. There are scores of such substances now in use, among which are acetanilid (q.v.), antipyrine (q.v.), methacetine, phenacetine (q.v.), thallin, phenetidin, phenocoll, and salocoll.

In 1800, Sir Humphry Davy, experimenting with nitrous oxide (q.v.) or laughing-gas, suggested its usefulness as an anæsthetic. In 1844, Dr. Horace Wells (q.v.), an American dentist, demonstrated that the gas may be actually employed for painless extraction of teeth. In 1828, Dr. Hickman suggested carbonic acid gas. As early as 1795, Dr. Pearson had used the vapor of sulphuric ether for the relief of spasmodic affections of the respiration. The fact that sulphuric ether could produce insensibility was known to Faraday in 1818, and was shown by the American physicians, Godwin (1822), Mitchell (1832), Jackson (1833), Wood and Bache (1834); but it was first used to prevent the pain of an operation by Dr. Crawford W. Long (q.v.), of Georgia, who removed a tumor from a patient under ether in 1842. Unfortunately, Long did not publish his discovery to the medical world, and failed to utilize his opportunity. Upon the suggestion of Dr. Jackson, Dr. W. T. G. Morton (q.v.), a dentist of Boston, after experimenting privately, introduced ether anæsthesia into general use in 1846. At the request of Dr. John C. Warren, Morton administered ether in an operation at the Massachusetts General Hospital on October 16, 1846. The fiftieth anniversary of this event was celebrated in Boston on October 16, 1896. In December, 1846, Robinson and Liston, in England, operated on patients rendered insensible by the inhalation of ether vapor. This substance was extensively used for a year, when Sir J. Y. Simpson, of Edinburgh, discovered the anæsthetic powers of chloroform (see CHLOROFORM), and introduced the use of it into his own department, midwifery. Since that time, chloroform has been the anæsthetic in general use in Europe; but ether is preferred in America, except for children and parturient women. Chloroform should not be given where there is weak action of the heart from disease. No anæsthetic should be given in case of chronic or severe kidney disease. Consult Probyn-Williams, *Guide to Administration of Anæsthetics* (New York, 1901).

AN'AGAL'LIS. See PIMPERNEL.

ANAGNI, ȧ-nä′nyē. An episcopal city in South Italy, situated on a hill 36 miles southeast of Rome (Map: Italy, H 6). Four popes were born here, and four, Gelasius II., Adrian IV., Alexander III., and Boniface VIII., sought refuge here from persecution, while many noble Italian families still have homes here. The cathedral of Santa Maria dates from the eleventh century, and contains many interesting antiquities, Papal and other. Vergil speaks of the ancient Anagnia, at one time the capital of the Hernici, as "wealthy Anagnia." Pop., 1881, 8023; 1901, 10,059.

AN'AGRAM (Gk. ἀνά, *ana*, backward + γράμμα, *gramma*, writing). The transposition of the letters of a word, phrase, or short sentence, so as to form a new word or sentence. It originally signified a simple reversal of the order of letters, but has long borne the sense in which it is now used. The Cabalists attached great importance to anagrams, believing in some relation of them to the character or destiny of the persons from whose names they were formed. Plato entertained a similar notion, and the later Platonists rivaled the Cabalists in ascribing to them mysterious virtues. Although now classed among follies, or at best among ingenious trifles, anagrams formerly employed the most serious minds, and some of the Puritan writers even commended the use of them. Cotton Mather, in his elegy on the death of John Wilson, the first pastor of Boston, in New England, mentions:

> His care to guide his flock and feed his lambs
> By words, works, prayers, psalms, alms, and *anagrams*.

The best anagrams are such as have, in the new order of letters, some signification appropriate to that from which they are formed. It was a great triumph of the mediæval anagrammatist to find in Pilate's question, "*Quid est veritas?*" (What is truth?) its own answer: "*Est vir qui adest*" (It is the man who is here). Anagrams, in the days of their popularity, were much employed, both for complimentary and for satirical purposes; and a little straining was often employed in the omission, addition, or alteration of letters, although, of course, the merit of an anagram depends much upon its accuracy.

Isaac D'Israeli (*Curiosities of Literature,* Volume III.) has a chapter on anagrams, which, as an exercise of ingenuity, he ranks far above acrostics. Among a great many considered by him worthy of record, are the following: the mistress of Charles IX. of France was named Marie Touchet; this became *Ie charme tout* ("I charm every one"). The flatterers of James I. of England proved his right to the British monarchy, as the descendant of the mythical King Arthur, from his name Charles James Stuart, which becomes *claims Arthur's seat.* An author, in dedicating a book to the same monarch, finds that in James Stuart he has *a just master.* "But perhaps the happiest of anagrams was produced on a singular person and occasion. Lady Eleanor Davies, the wife of the celebrated Sir John Davies, the poet, was a very extraordinary character. She was the Cassandra of her age, and several of her predictions induced her to imagine that she was a prophetess. As her prophecies in the troubled times of Charles I. were usually against the Government, she was at length brought by them into the Court of High Commission. The prophetess was not a little mad, and fancied the spirit of Daniel was in her, from an anagram she had formed of her name,

ELEANOR DAVIES.
Reveal, O Daniel!

The anagram had too much by an *l,* and too little by an *s;* yet *Daniel* and *reveal* were in it, and that was sufficient to satisfy her inspirations. The Court attempted to dispossess the lady of the spirit, while the bishops were in vain reasoning the point with her out of the Scriptures, to no purpose, she poising text against text; one of the Deans of the Arches, says Heylin, shot her through and through with an arrow borrowed from her own quiver; he took a pen, and at last hit upon this excellent anagram:

DAME ELEANOR DAVIES.
Never so mad a Ladie!

The happy fancy put the solemn court into laughter, and Cassandra into the utmost dejection of spirit. Foiled by her own weapons, her spirit suddenly forsook her, and either she never afterward ventured on prophesying, or the anagram perpetually reminded her hearers of her state, for we hear no more of this prophetess." On a visit to King's Newton Hall, in Derbyshire, Charles II. is said to have written on one of the windows, *Cras ero lux* (To-morrow I shall be light), which is the anagram of *Carolus Rex.*

Anagrams have now gone out of fashion, or rather have been relegated to the puzzle column of the magazine for the household. And yet even in this century, writers have formed their pen-names by recombining the letters of their real names. For example, Bryan Waller Proctor is still called Barry Cornwall; add *poet,* and the anagram becomes complete. Besides D'Israeli, cited above, consult Wheatley, *On Anagrams* (Hartford, 1862).

AN'AHEIM. A city in Orange Co., Cal., 27 miles by rail southeast of Los Angeles; on the Southern Pacific and the Southern California railroads (Map: California, E 5). It is in a fertile valley and has fruit canning and drying interests, and a large trade in oranges, lemons, walnuts, and farm and dairy products. Beer, wines, and brandies are manufactured. The water-works and electric light plant are owned and operated by the municipality. Anaheim was settled by fifty German families in 1857 on coöperative principles, and in 1878 was incorporated as a town. An interesting account of its early history is given in Nordhoff, *Communistic Societies of the United States* (New York, 1875). Pop., 1900, 1456; 1905 (local est.), 3250.

ANAHUAC, ä'nȧ-wäk'. A Mexican term applied to the great central plateau of Mexico, which comprises nearly half of the total area of the Republic. Roughly speaking, it lies between 15° and 31° N. lat. and long. 95° and 110° W.; while its altitude ranges between 6000 and 9000 feet. The plateau is the granary and stock-raising centre for the country, whose chief cities are mainly situated upon it. The name Anahuac was the Aztec term for all Mexico.

ANAÏTIS, ȧ-nä'ĭ-tĭs. The ancient Persian goddess of waters, whose worship was widely spread in the East in early times. The Avesta (q.v.) celebrates her praise as the celestial stream *Ardvi Sura Anahita* "the lofty, mighty, and undefiled," and describes her descent from the heavens. She appears as *Anahata* in the cuneiform inscriptions of the Persian king Artaxerxes II. (fourth century B.C.). Her name as *'Αναιτις, Anaïtis,* is in Strabo, Plutarch, and elsewhere, and she became familiar in Greece as Venus Anaïtis (*'Αφροδίτη 'Αναιτις, Aphroditē Anaïtis*). Consult: Windischmann, *Die Persische Anahita oder Anaïtis* (Munich, 1856);

Jackson, *Iranische Religion*, in Geiger and Kühn's *Grundriss der iranischen Philologie*, ii. (Strassburg, 1896-1904).

AN'AKIM (Heb. children of Anak, i.e., the long-necked, a giant). Represented in the Old Testament as a race of giants (Numbers xiii : 33; Deuteronomy ii : 10-12, etc.), one of whose strongholds was Kirjath-Arba or Hebron in southern Palestine (Joshua xiv : 12-15), but who were spread over the mountains of Judah and Israel in Onal. Anakim is an indefinite designation like Rephaïm for miscellaneous groups of the pre-Israelitish inhabitants of Palestine. They were conquered by Joshua together with the rest of the Canaanitish peoples (Joshua xi : 21), though according to verse 22 a remnant survived in the Philistine cities of Gaza, Gath, and Ashdod.

ANAL'CITE, Analcime, or Cubicite (Gk. ἀν, *an* priv. + ἀλκή, *alkē*, strength; refers to its weak electricity when heated or rubbed). A common zeolite mineral, chemically a hydrated silicate of sodium and aluminum. It crystallizes in isometric forms, commonly the trapezohedron. Its lustre is vitreous, its color white, greenish, or faintly red. It occurs with other zeolites.

AN'ALEM'MA (Gk. ἀνάλημμα, a support, prop; a sun-dial). A name given to an orthographic projection of a sphere upon the plane of a meridian, the point of sight being assumed at an infinite distance on a line normal to the given plane and passing through the centre of the sphere. The term was also applied to the sun-dial, but more often to an instrument of brass or wood, on which the above projection could be drawn, and which was used for astronomical purposes. The term is further employed to designate a scale, often seen on terrestrial globes, showing the declination of the sun and the equation of time for various days of the year.

AN'ALGE'SIA. See Anæsthesia.

ANALOGISTS. See Philology.

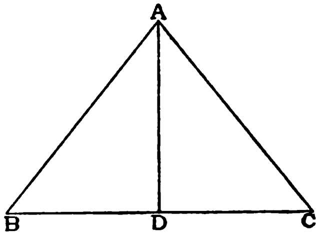
AN'ALOGUE (Gk. ἀνά, *ana*, according to + λόγος, *logos*, due ratio). A term in comparative anatomy. Organs are *analogous* to one another, or are *analogues*, when they perform the same function, though they may be altogether different in structure; as the wings of a bird and the wings of an insect. Organs, again, are *homologous*, or *homologues*, when they are constructed on the same plan, undergo a similar development, and bear the same relative position, and this independent of either form or function. Thus, the arms of a man and the wings of a bird are homologues of one another. See Homology.

ANAL'OGY (Gk. ἀναλογία, *analogia*, equality of ratios). In general, an agreement or correspondence in certain respects between things in other respects different. Euclid employed it to signify proportion, or the equality of ratios, and it has retained this sense in mathematics; but it is a term little used in the exact sciences, and of very frequent use in every other department of knowledge and in human affairs. In grammar we speak of the analogy of language; i.e., the correspondence of a word or phrase with the genius of the language, as learned from the manner in which its words and phrases are ordinarily formed. Analogy, in fact, supposes a rule inferred from observation of instances, and is the application of this rule to other instances not precisely, but somewhat, similar. We venture upon this application with more or less confidence, according to the degree of ascertained similarity, and according to the extent of observation from which our knowledge of the rule has been derived. John Stuart Mill, in his *Logic*, states the formula of analogy in this way: "Two things resemble each other in one or more respects; a certain proposition is true of the one, therefore it is true of the other." What makes analogical reasoning successful at all is the fact that superficial resemblances often point to fundamental identity in type. Analogical reasoning is the assumption of a deeper significance in similarities than our knowledge of the facts warrants. When this assumption is justified by the event, the analogy has been fruitfully suggestive; when it is not, the analogy has been misleading. Even when analogy leads to discovery, it does this merely by suggestiveness; the final establishment of the truth analogically adumbrated is never accomplished by analogy, but by some stricter logical method. Thus, reasoning from analogy indeed warrants only probable conclusions; but the probability may become of a very high degree, and in the affairs of life we must often act upon conclusions thus attained. Reasoning from analogy, however, requires much caution in the reasoner. Yet even when its conclusions are very uncertain, they often serve to guide inquiry and lead to discovery. Many of the most brilliant discoveries recently made in natural science were the result of investigations thus directed. In law, reasoning from analogy must often, to a certain extent, be admitted in the application of statutes to particular cases. Upon similar reasoning, the practice of medicine very much depends. In literary criticism, it is also often necessary for purposes of interpretation, the sense of the author in a passage somewhat obscure being in some measure determined according to passages in which he has expressed himself more clearly. The application of this rule to the interpretation of Scripture is a point of difference between Protestants and Catholics, the latter insisting upon the interpretation of difficult passages by ecclesiastical tradition and authority. Protestant theologians have very generally employed, with reference to this rule of interpretation, the phrase "analogy of faith," deriving it from Romans xii. 16; but the meaning of the expression in that verse is disputed. (See Phonetic Laws.) The opposite of analogy is ***anomaly*** (Gk. irregularity); and this term is used not only in grammar, but with reference to objects of natural history which in any respect are exceptions to the ordinary rule of their class or kind. In physiology, analogy is similarity of function between organs which are structurally or morphologically different; e.g., the tail of a fish and that of a whale are analogous organs; in this usage analogy is opposed to homology, which refers to the structural similarity of organs that may even perform different functions; e.g., the wing of a bird and the arms of a man.

ANAL'YSIS (Gk. ἀνάλυσις, a resolution into parts, from ἀνά, *ana*, up + λύειν, *lyein*, to loosen). A term frequently employed in general philosophy and in the sciences, as the opposite of the term synthesis. In philosophy the term analysis is generally applied to the mental act of distinguishing within a given object its various characteristics; thus, the process by which we recognize that an apple is a thing whose attributes are sweetness, roundness, rosiness, etc., is said to be a process of analysis. On the contrary, the process by which we recognize that various properties together form the characteristics of a single object, is termed synthesis; thus the consolidation, in our mind, of the several characteristics of an apple into a single concept, is a synthesis. The two processes are complementary aspects of the same mental act. It should be borne in mind that analysis does not really destroy the unity of a given object; it merely recognizes various distinctions within that unity. Nor does synthesis fuse into indistinguishableness the characteristics it starts with; it correlates them into a unity, but in that unity the identity of each part is fully preserved.

In mathematics the term analysis is employed, on the one hand, to denote a potent method of discovery and demonstration; on the other hand, and more or less inaptly, to designate collectively several important branches of modern mathematics.

The method said to be analytic consists in resolving a given relation into its mathematical elements. Analysis in this sense of the term is sometimes applied to the solution of geometric questions. It consists in assuming a certain relation to be the true answer to the question, and resolving that relation into simple truths. Euclid (*Elements*, Book XIII.), formulates this idea as follows: "Analysis is the obtaining of the thing sought by assuming it and so reasoning up to an admitted truth." For example, let the question be, In what ratio does the altitude of an isosceles triangle divide its base?



The simple answer that suggests itself through the inspection of a figure is, that the base is bisected. Assume this to be so. In that case the two triangles into which the altitude divides the given triangle are identically equal, because their sides are respectively equal; and therefore the two angles made by the altitude and the base are also equal. But the latter conclusion is an evident truth, if we remember that the altitude of a triangle is a line perpendicular to its base. We therefore infer that our assumption was correct and that the base is really bisected. Furthermore, by reversing the above process we can now demonstrate our assumed truth synthetically; i.e., reconstruct it from the simple, admitted truths, to which the analysis has led.

Now, although the demonstrations of geometric theorems and perhaps most of the theorems themselves, were originally discovered in the manner just indicated, by analysis, most of the ordinary text-book demonstrations are undoubtedly syntheses, for they gradually lead from the mathematical elements—the axioms—to more or less complex truths. Geometry is therefore spoken of as a synthetic science. However, the *reductio ad absurdum*, which is not infrequently employed, is a purely analytical method, differing only in form from the type of analysis considered above. The suggested relation is, namely, assumed to be not true, but false, and this is shown to lead to absurd conclusions—the inference being that the suggested relation is necessarily true.

In designating a part of mathematical science, the term analysis is applied, on the one hand, to the theory of functions (including series, logarithms, curves, etc.), on the other hand, to the mathematics of infinite quantities, comprising the differential calculus, the integral calculus, and the calculus of variations. Algebra, although usually limited to equations, includes in the wider sense of its name the branches just enumerated. Indeed, it is because of their relation to algebra that these branches have been united under the general term of mathematical analysis. Algebra itself, however, is far from being uniformly analytical, and many an instance of pure synthesis may be found in any of the branches of applied algebra, say in analytical geometry. In general, there is no branch of human thought in which the method of analysis, or that of synthesis, is used exclusively. The complete abolition of either of these methods would involve not a small diminution in our power of establishing interesting truths.

In discussions concerning the methods of science, the processes of analysis and synthesis are often erroneously identified with those of induction and deduction. The reason of this lies mainly in the fact that there has been considerable disagreement as to the proper definition of the terms in question. The distinction between the two pairs of antithetic terms becomes perfectly clear, however, if we define analysis as leading from the compound to the elementary, and synthesis as leading from the elementary to the compound; induction as leading from the particular to the general, and deduction as leading from the general to the particular. As thus defined, analysis, as well as synthesis, may be coincident, though not identical, with either induction or deduction. Thus, to turn for an illustration again to mathematics, the ordinary demonstration of a geometric theorem is a deduction; for what can be more general in character than the axiomatic truths from which the theorem is deduced? But the demonstration is also a synthesis; for what can be more elementary than those axioms which are used in reasoning up to the theorem? On the other hand, Newton's binomial theorem, as often demonstrated in text-books of algebra, presents an instance of synthesis coincident with induction. The general relation expressed by that theorem is induced by the examination of a number of particular instances. But the demonstration is also a true synthesis, for it combines a number of relations into one.

More or less extensive discussions of the analytical processes of philosophy may be found in the following works: R. H. Lotze, *Logic*, English translation (Oxford, 1888); F. H. Bradley, *Principles of Logic* (London, 1883); L. T. Hobhouse, *Theory of Knowledge* (London, 1896), and Bosanquet, *Logic* (Oxford, 1888). See also articles, ANALYTIC JUDGMENT; JUDGMENT; KNOWLEDGE, THEORY OF, and LOGIC.

ANALYSIS, Chemical. The art of determining the chemical composition of substances. The derivation of the word analysis (see preceding article) suggests that chemical analysis necessarily requires the breaking up of substances into their constituent parts. In practice the term is used in a wider sense, and is often applied to methods of testing that involve no processes of separation. In most cases, however, one or the other constituent is actually isolated, or some constituents of the original substance, which would interfere with the examination, are actually removed.

An analyst may restrict himself to merely determining what are the constituents of the substance submitted to him; in that case the analysis is *qualitative*. Or he may also determine the relative amounts of some or all of the constituents; then the analysis becomes *quantitative*. In some cases he can only state what elements are present, and in what quantities they enter into the composition of the given substance. The analysis is then said to be *ultimate*. In most cases, however, he further tries to determine in what combinations and in what conditions in respect to their capacity of forming combinations the elements exist in the given substance; and then the analysis is termed *proximate*. The ultimate analysis of organic substances is of great importance, and has been brought to high perfection. (See Carbon Compounds.) On the other hand, the proximate analysis of organic substances is often a task beyond the power of analytical chemistry. Attempts, however, have been made to treat this subject, too, in a systematic manner.

Preliminary Examination of Inorganic Substances. When a substance is submitted for qualitative analysis, the chemist first notes its color and form—the latter with the aid of a simple magnifying glass. The substance is then usually subjected to an examination by means of the blowpipe (q.v.) or the non-luminous gas-flame. (See **Flame.**) Blowpipe analysis has been elaborated into a systematic scheme for the detection of all the important metallic and of some acidic radicals, and has proved of great value, especially to the mineralogist. The chemist, as a rule, makes only a brief examination to determine the general nature of the substance, and to answer such questions as whether water, organic matter, silicates, complex cyanides, large quantities of an easily reducible metal, sulphur and arsenic, are or are not present, such constituents often rendering necessary a modification of the usual scheme of systematic analysis. Heating a small portion of the substance in a closed glass tube reveals the presence of most kinds of organic matter by the smell and separation of carbon, and the presence of water by the drops which condense in the cooler part of the tube. Heating on charcoal with a reducing flame, sometimes with the aid of fluxes, shows the presence of metals that give volatile oxides, the latter forming characteristic coats on the charcoal; and the same test makes it possible to detect any important quantity of an easily reducible metal, metals in the free state being readily identified by their lustre and physical properties. The behavior of the substance when fused with a bead of sodium metaphosphate or of sodium carbonate shows whether a silicate or much silica is present, etc. Often additional special tests are made. For example, gently warming a small portion of the substance with concentrated sulphuric acid may serve to detect volatile acidic substances, such as sulphurous acid and nitrous acid, which might be lost in the regular processes or appear in another form.

If the substance submitted for analysis is a liquid, its color and odor are noted, its reaction toward litmus is ascertained, a portion is evaporated to dryness, and the solid residue, if there is any, is subjected to the preliminary examination as in the case of any other solid.

Qualitative Inorganic Analysis. Before a systematic qualitative analysis of a solid substance can be undertaken, the substance must be obtained in solution. Sometimes substances submitted for analysis are found to be directly soluble in water. In most cases, however, substances cannot be dissolved unless transformed chemically. Since most chlorides and most inorganic acids are soluble in water, the desired transformation can usually be effected by treating the finely powdered substances with aqueous hydrochloric acid, which converts the metals or metallic oxides present into chlorides, while the acids originally combined in the substance are set free. In case metals (such as silver) are present, which form insoluble chlorides, or in case non-metals (such as sulphur or arsenic) are present, or in case hydrochloric acid does not attack the substance, nitric acid is used. By this the metallic compounds present in the substance are transformed into nitrates, and all normal nitrates are soluble in water; on the other hand, the non-metals present are mostly changed into the corresponding oxygen acids, which are likewise soluble in water—sulphur, for instance, being transformed into sulphuric acid. Many important and familiar substances, however, resist the action of both of these acids. A few, as gold and platinum, will dissolve, forming soluble compounds in a mixture of hydrochloric and nitric acids, the so-called aqua regia, which, on warming, gives off free chlorine. But other substances, such as glass, porcelain, and many natural silicates, resist the action of acids almost entirely. Such substances are usually broken up by melting them with carbonates of the alkali metals and potassium nitrate, or by treatment with hydrofluoric acid. Subsequent treatment with water and hydrochloric acid then usually yields the required solutions.

Let us suppose that we have obtained a clear solution in nitric acid, which may contain all the more familiar metals and is free from organic matter. To this solution we add hydrochloric acid; if we obtain a white solid substance, which does not dissolve in a moderate excess of acid, we know we must have present some or all of the three metals, lead, silver, or mercury in the univalent form, since, of all the more familiar metals, only these three form insoluble, or nearly insoluble, chlorides. The solid precipitate is separated from the liquid by filtration, and we have then on the filter a solid which may consist of any or all of the chlorides of lead, silver, and univalent mercury. A study of the properties of these chlorides shows that lead chloride is freely soluble in hot water, while the other two are not. Therefore, if the mass is treated with hot water, the lead chloride, if present, will dissolve, and can be filtered off while the other two remain behind. The liquid is then examined for lead, which is easily done, since all metals which could interfere with the test have been separated. Further, since silver chloride is known to be easily soluble in aqueous ammonia, while mercurous chloride is converted into a black, insoluble mass containing free mercury, one might assume that treatment of the two chlorides with ammonia solution would affect an easy separation of silver chloride from mercurous chloride. This case, however, well illustrates one of the difficulties of analytical work. If the amount of mercurous chloride is large in proportion to the amount of silver chloride, the metallic mercury set free by the action of ammonia causes the formation of metallic silver, which is practically insoluble in ammonia. If, therefore, ammonia has failed to extract anything from the precipitate in question, we cannot conclude that silver is absent. We must, then, treat the black mass with a mixture of nitric and hydrochloric acids, which dissolves the black substance containing mercury; while the silver, if at all present in the original substance, remains behind, again in the form of silver chloride, but this time unmixed with anything else. Such cases frequently occur. So often is the behavior of a substance toward a reagent modified by the presence of other substances, that no scheme of analysis worked out at the writing table possesses any value until thoroughly tested in the laboratory.

The filtrate obtained on precipitating out the three metals just spoken of is treated with sulphuretted hydrogen. This precipitates a second group of metals, which are separated from one another by methods analogous to those employed for the first group. The filtrate obtained on precipitating out the metals of the second group is usually treated with ammonium sulphide, and the filtrate from the ammonium sulphide group with ammonium carbonate. Thus the metals that may be present in the original substance are separated into several groups, and then special methods are employed to separate and test for the several metals composing each group.

The acid radicals are tested for in a somewhat similar manner, but usually less systematically; because by the time all the metals present have been identified, the analyst usually is able to exclude the possibility of the presence of a large number of acids.

The spectroscope (q.v.) is usually applied to identify the metals potassium and lithium, and is quite indispensable when substances are to be examined to ascertain whether they are in the purest condition possible, since the instrument is capable of revealing the presence of the merest traces of substances. See SPECTRUM ANALYSIS.

The system of analysis usually followed may be carried out mechanically and almost without intelligence, if the substance examined contains only the more familiar metals and acids, and those in considerable quantities. In fact, qualitative analysis is criticised by teachers on this account, when used as a discipline, or as a means of acquiring a scientific knowledge of chemistry. The ordinary scheme, however, overlooks even some elements of common occurrence, as titanium; and when the chemist has to take into consideration small amounts and the less familiar elements, all his chemical knowledge and acuteness find full field for exercise.

It may be seen from the above that the chemist relies on two sets of properties for the identification of a substance. First, those that belong to the substance itself under ordinary conditions; for example, the yellow color and the lightness of sulphur. Such properties may be called properties of condition. On the other hand, if sulphur is heated sufficiently without access of air, it assumes the form of a red vapor; if heated with access of air, it forms with the oxygen of the air a colorless gas possessing a characteristic odor. The first of these changes is physical; the second, chemical. Physical or chemical changes may thus serve to bring out certain properties that are just as characteristic of the substance as the properties of condition. Such properties may be called properties of reaction. They are far more numerous than properties of condition, and far more useful to the analyst. In the case of sulphur, for instance, the properties of condition are only apparent when the sulphur is in a nearly pure form; but the two properties of reaction just mentioned as an example enable us to identify sulphur even when mixed with so much foreign matter that the characteristic color and lightness are quite masked.

QUANTITATIVE ANALYSIS. Before beginning a quantitative analysis the chemist must know, in part at least, the qualitative composition of the substance to be analyzed. This knowledge may be obtained by a special qualitative analysis, or, more frequently, from the results of numerous analyses of similar substances.

Methods of quantitative analysis which involve weighing (see BALANCE) are termed *gravimetric*. Methods that involve measuring the volumes of solutions are termed *volumetric*. Finally, methods involving the decomposition of substances by means of an electric current are termed *electrolytic*.

As an illustration of the methods of gravimetric analysis, we may take the analysis of an alloy of silver and copper, such as is used for silver coins in the United States. If high-class weights and a balance are at the disposal of the analyst, not more than half a gram (less than one-fourth of a dime) is the most suitable weight to be taken of the alloy. If the weights or the balance is inferior, a larger amount must be taken, so that the errors of weighing may remain proportionately small. The alloy is dissolved in nitric acid, the insoluble residue (carbon and tin oxide) filtered off and weighed, and the filtrate is treated with hydrochloric acid to precipitate silver chloride, just as in qualitative work. In quantitative work, however, certain precautions must be taken in carrying out this simple operation. Thus, only a slight excess of hydrochloric acid must be added, since silver chloride is somewhat soluble in a large excess of that acid; the liquid must be vigorously stirred and warmed to cause the precipitate to assume a form in which it can be easily filtered and washed, etc. The silver chloride is then filtered off, dried, and weighed, proper corrections being made for the weight of the ash of the filter. The amount of silver in the alloy is then readily calculated from the weight of silver chloride yielded. The filtrate from the silver chloride contains copper and usually a small amount of lead. The exact amount of copper contained in this filtrate may be best determined by electrolysis. For this purpose the filtrate is first evaporated to dryness, in order to get rid of the hydrochloric acid; the residue is taken up with dilute nitric acid, and the solution thus obtained is subjected to the action of an electric current passing between two carefully weighed platinum terminals immersed in the liquid. The copper is thus deposited in the metallic state on the electro-negative terminal, while the lead is deposited in the form of lead dioxide on the terminal connected with the positive pole. The gain in weight of the terminals gives directly the weight of copper and permits the calculation of the weight of the lead.

Another method, involving the fusion of substances by heat, and usually termed the "fire method," is applied chiefly to the determination of metals in ores, and is especially useful in the case of gold and silver ores. Thus, the amount of silver in an ore free from gold may be easily and quickly found by heating a weighed portion of the ore with metallic lead and a little fused borax in an oxidizing atmosphere. The lead melts, the ore floats on the surface, sulphur and arsenic are volatilized as oxides, the lead is partly oxidized, and the oxide of lead forms a liquid slag with most of the constituents of the ore. At the end of the operation a lead button is obtained, containing the silver. This button is placed on a porous support made of bone-dust (calcium phosphate), and again heated in an oxidizing atmosphere. The lead melts and oxidizes, part of the oxide passes off as gas and part sinks into the porous support, while the silver remains behind as a metallic button, which can be weighed. If gold is present, it is found and weighed with the silver, and then separated by a wet process.

Although gravimetric methods are the more generally applicable, volumetric methods are much more commonly used in the everyday work of the technical analytical chemist. Hundreds of volumetric determinations are made daily in all great manufacturing centres for every one gravimetric determination. As an illustration of volumetric analysis, we may take a method used for the determination of iron in iron ores, and applicable to all iron ores found in the United States, except those containing titanium. The process depends on the fact that when a solution of potassium permanganate is added to an acid solution of iron in the ferrous state, the iron is changed into the ferric state, while the strongly colored permanganate is transformed into an almost colorless manganous salt, the volume of potassium permanganate solution thus decolorized being proportional to the amount of ferrous iron present in the acid solution. This fact is made use of by the analyst in the following manner: He first determines the maximum volume of the given permanganate solution which can be completely decolorized by a known amount of iron. For this purpose, say, 300 milligrams of pure iron are dissolved in hydrochloric acid and some metallic zinc is added in order to make certain that all the iron is present as ferrous chloride, $FeCl_2$ (and not as ferric chloride, $FeCl_3$). The given permanganate solution is then slowly added from a burette to the solution of iron until the disappearance of the color has ceased to take place. The burette then shows what volume of the permanganate solution can be decolorized by 300 milligrams of iron dissolved as a ferrous salt. Suppose the volume of permanganate solution thus measured is 40 cubic centimeters. Then it is evident that one cubic centimeter of the solution could be decolorized by 7.5 milligrams of iron. A weighed portion of the ore to be examined, say, 500 milligrams of it, is now treated in exactly the same manner as were the 300 milligrams of iron; i.e., the ore is dissolved in hydrochloric acid, its iron is carefully reduced to the ferrous state, and the permanganate solution is slowly added from the burette until no more can be decolorized. Suppose the volume of the permanganate solution decolorized this time is 41 cubic centimeters. Then, since 7.5 milligrams of iron are required to decolorize every cubic centimeter of the permanganate solution, it is evident that the 500 milligrams of the ore must contain 307.5 (i.e., 7.5 × 41) milligrams of iron, and hence the ore is reported to contain 61.5 per cent. of iron.

Special Methods of Analysis. Any physical property which depends on the amount of substance present, and is capable of measurement, may be used for quantitative determinations. Thus, the specific gravity of liquids, which can be readily determined with great accuracy, is extensively used to determine the amount of the dissolved substance in pure or nearly pure solutions. In this manner the amount of alcohol, potassium or sodium hydroxide, common salt, and, indeed, of all the more familiar salts contained in aqueous solutions may be determined more readily than in any other way. For determinations of this kind, when no high degree of accuracy is required, the hydrometer is extensively used in chemical laboratories. (See Hydrometer, and Alcoholometry.) Among other properties used may be mentioned the coefficient of refraction, the optical rotatory power—much used in determining the strength of sugar solutions (see Sugar), the intensity of the color or the degree of opacity of solutions and of liquids containing solids in suspension, the electrical conductivity, the boiling point of solutions, the melting point of solids, etc.

Analysis of Gases. The analysis of gases differs from that of solids and liquids in that it is more easy to measure than to weigh gases, and hence the results are usually given in percentages by volume. For many gases reagents are known which absorb the gas readily and completely. Thus, a mixture of carbon dioxide, ethylene, oxygen, carbon monoxide, and nitrogen may be analyzed by bringing a measured volume into contact with caustic potash (which absorbs the carbon dioxide), then with fuming sulphuric acid (which absorbs the ethylene), then with an alkaline solution of pyrogallol (which absorbs the oxygen), then with a solution of cuprous chloride (which absorbs the carbon monoxide), and noting the contraction caused by each treatment. The nitrogen remains behind unabsorbed. Hydrogen and marsh-gas are usually determined by combustion with oxygen. Gases very soluble in water, such as sulphur dioxide, are absorbed in that liquid, and then the amount dissolved is determined by a volumetric process. Carbon dioxide in air offers a special case. As in normal air only 3 parts in 10,000 are present, the ordinary process of measuring the volume before and after treatment with caustic potash requires special apparatus and great care to get good results. Usually a large volume is treated with a measured quantity of a solution of barium hydroxide of known strength, a portion of the barium hydroxide being thus converted into insoluble barium carbonate, and the rest estimated volumetrically.

When the highest degree of accuracy in gas analysis is required, the gases must be confined over mercury; further, only solid absorbents must be used, and careful corrections must be made for changes of pressure and temperature. When water is used to confine the gas, some inaccuracy is introduced, since all gases are more or less soluble in water. In technical work, however, a very high degree of accuracy is but rarely required. The technical analysis of gases has assumed great practical importance, owing to the extension of the use of gaseous fuels.

ACCURACY. The accuracy of analytical work varies within wide limits, according to the purpose which an analysis is intended to serve. The most accurate analyses are those made to determine the proportions by weight, in which the various elements unite with each other. Thus, the proportion in which silver and chlorine unite forms one of the best determined constants of nature. In determining the proportion in which magnesium unites with chlorine, a series of determinations has been obtained, agreeing so perfectly with each other that a loss or gain of only one-twentieth of a milligram of the magnesium chloride analyzed corresponds to the difference between the highest or lowest results and the average. No such accuracy is attainable in commercial or technical work. Nor, if attainable, would it be of any value, since it is but seldom possible to obtain samples representing precisely the average composition of large quantities of material.

The aim of the commercial and technical analyst is usually not to attain extreme accuracy, but to obtain results which he knows to be correct within certain limits. Thus, if an analyst is required to find the percentage of copper in a sample representing a large cargo of ore, in order to fix its commercial value, he can determine the copper by the electrolytic method to within about one part in four hundred without undue expenditure of time or labor. If the object of the analysis is to enable the superintendent of the smelting furnace to make up charges of a suitable content of copper, a much quicker volumetric process is used; the results are then less accurate than those of the electrolytic process, but still much more accurate than is necessary for the purposes of the smelter. When it becomes necessary to determine the amount of substances which occur in relatively very small quantities, it is impossible to avoid relatively large errors. For instance, in determining the amount of phosphorus in a specimen of steel, where the total amount is only about one part in a thousand, the analyst is not surprised to find that, in spite of all care, differences of 2 per cent. occur between the results of determinations made carefully and under exactly the same conditions.

HISTORY. Systematic chemical analysis only dates from the latter half of the eighteenth century, although chemists of an earlier period had accumulated observations which made it possible to test for the presence of many substances. Bergman (1735-84) first attempted to give a plan for systematic qualitative analysis of inorganic substances in the wet way. Until the work of Lavoisier (1743-94) had shown the importance of relations by weight, quantitative determinations attracted little attention, although such determinations were by no means entirely wanting. After the triumph of Lavoisier's views, the importance of quantitative analysis was fully seen; and the labors of Klaproth (1743-1817), Proust (1755-1826), and Vauquelin (1763-1829), rapidly enriched chemistry with new methods. But it is to Berzelius (1779-1848) that quantitative analysis owes the heaviest debt. Berzelius published tables of the atomic weights of all the elements well known at that time, and some of his values for these important constants have scarcely been improved on since. In the course of these researches an immense number of new methods were developed. Two of his pupils, Heinrich Rose (1795-1864) and Friedrich Wöhler (1800-82), not only added to the methods in use, but published comprehensive works on inorganic analysis. The final edition of Rose's work, published after his death by his pupil, R. Finkener, remains an invaluable work to the analyst of to-day. Although K. R. Fresenius (1818-97) added many new methods, his great service, which secures him a conspicuous place in the history of analytical chemistry, was the collection and comparison of the various methods in use, the publication of text-books, which have formed the models of most others since published, and the founding of a periodical devoted to analytical chemistry. The last editions of his standard works are in the hands of every analyst.

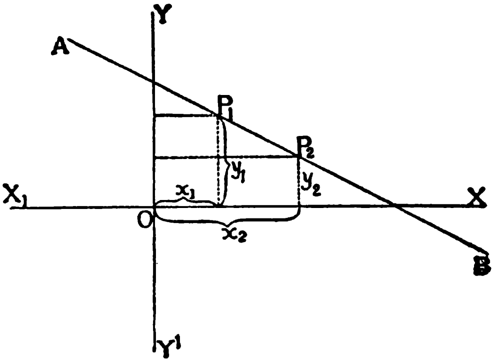
Volumetric analysis was introduced by Gay-Lussac (1778-1850); but although he gave the first of his important processes to the world as early as 1824, it was not until the publication of Fr. Mohr's text-book on the subject that volumetric analysis began to rank in importance with gravimetric methods. The ultimate analysis of organic bodies was attempted with some success by Lavoisier and Berzelius. Gay-Lussac, in 1815, introduced the use of cupric oxide, and Liebig (1803-73) gave the process essentially its present form. Dumas (1800-84) introduced, in 1830, the method for the determination of nitrogen by direct measurement of the liberated gas, which is still preferred in strictly scientific work to the easier method devised by Kjeldahl.

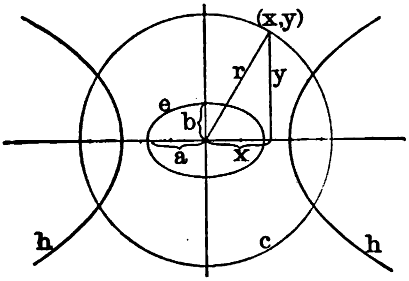
Many attempts were made to analyze gases in the eighteenth century and in the beginning of the nineteenth, but it is to Bunsen (1811-99) that we owe the perfection of the methods at present in use for gas analysis. The first edition of his text-book, *Gasometrische Methoden*, was published in 1857. The improvements since that time have been principally in the direction of adapting the methods to rapid work for technical purposes.

BIBLIOGRAPHY. Rose, *Handbuch der analytischen Chemie*, completed by Finkener (Leipzig, 1867-71); Mohr, *Lehrbuch der chemisch-analytischen Titrirmethoden*, edited by Classen (Brunswick, 1886), and *Chemisch-technische Untersuchungs-Methoden*, edited by Lunge (Berlin, 1900); Fresenius, *Manual of Qualitative Chemical Analysis*, translated by Wells (New York, 1897); Fresenius, *Anleitung zur quantitativen chemischen Analyse* (Brunswick, 1875-87); Hempel, *Methods of Gas Analysis*, translated by Dennis (New York, 1892); Treadwell, *Kurzes Lehrbuch der analytischen Chemie* (2 vols., ed. 3, Leipzig and Vienna, 1904-05).

AN'ALYT'IC GEOM'ETRY. Geometry treated by means of algebra. Geometric conditions are expressed by equations which, after certain transformations, are interpreted again in geometric concepts. The powerful algebraic method is thus made use of for discovering and demonstrating in a simple and easy manner the most complicated relations existing between quantities in space.

The interpretation of geometric relations in algebraic terms is effected by the use of some system of coördinates (q.v.). The primitive system of coördinates, called rectangular coördinates, is due to Descartes (Lat. *Cartesius*), from which fact they are often called Cartesian. In this system the position of a point (as P_1, in the figure) is determined by its distance from the fixed axes in the plane, called *axes of coördinates*, which intersect at right angles in a point called the *origin*. The distance x_1 of P_1 from YY' is called the *abscissa* of P_1, and the distance y_1 from XX', is called the ordinate. The two lines x_1, y_1, are called the coördinates of P_1. Similarly, the coördinates of P_2 are x_2, y_2. P_1, P_2, or the points (x_1, y_1), (x_2, y_2) are sufficient to determine the straight line AB. The algebraic function (q.v.), $y = ax + b$, a, b, being constants, will have different values according to the various values given to x. The various values of x, as x_1, x_2, x_3—taken with the corresponding values of y, as y_1, y_2, y_3—will represent a series of points (x_1, y_1), (x_2, y_2), (x_3, y_3), lying in a straight line. That is, an algebraic equation of the first degree is represented by a straight line. In a similar manner a function of the second degree is represented by a curve. In the figure, c is a circle whose equation is $x^2 + y^2 = r^2$, r being the radius of the circle. This is evident by reference to the figure, since the coördinates of any point (x, y) form the sides of a right-angle triangle of hypotenuse r, so that $x^2 + y^2 = r^2$. Here the function of x is $\sqrt{r^2 - x^2}$, since $y = \sqrt{r^2 - x^2}$. The curve e is an ellipse whose equation is $b^2x^2 + a^2y^2 = k^2$, a being the semi-major axis and b the semi-minor axis. The curve h is an hyperbola whose equation is $b_1^2x^2 - a_1^2y^2 = k_1^2$. If the equations $x^2 + y^2 = r^2$ and $b_1^2x^2 - a_1^2y^2 = k_1^2$ are solved for x, y, their roots are the coördinates of the points of intersection of the curves c, h. These values may be real or imaginary; if real, the curves cut in real points, as in the case of c, h; if imaginary, the curves are said to cut in imaginary points, as in the case of e, h.





The practical work of plotting a curve may be explained by referring to a particular example; thus, to represent graphically the equation $2x^2 - 3y^2 = 10$. Rearranging and solving the equation for y, $y = \pm \frac{1}{3}\sqrt{6(x^2 - 5)}$. Therefore, by giving x various values (noticing that $x^2 > 5$ for real values of y) we have corresponding values of y as follows:

$$x = \pm \sqrt{5}, \pm \sqrt{6}, \pm \sqrt{7}, \pm \sqrt{8}, \pm \sqrt{9}.$$
$$y = 0, \pm \tfrac{1}{3}\sqrt{6}, \pm \tfrac{2}{3}\sqrt{3}, \pm \sqrt{2}, \pm \tfrac{2}{3}\sqrt{6}.$$

Taking the approximate square roots, and laying off the abscissas and ordinates as indicated, and then connecting the successive points, the graph is the hyperbola h, shown in the figure.

The power of the analytic forms to express geometric relations may be seen from the following: Let $z_1 = 0$ and $z_2 = 0$ represent the equations $a_1x^2 + b_1y^2 - c_1 = 0$ and $a_2x^2 + b_1y_2^2 - c_2 = 0$. Any values of x, y satisfying these two equations will evidently satisfy the equation $(a_1x^2 + b_1y^2 - c_1) - k\ (a_2x^2 + b_2y^2 - c_2) = 0$, k being any constant. But this equation is $z_1 - kz_2 = 0$. Hence, if $z = 0$, $z_2 = 0$ are the equations of any two curves, any point common to the two satisfies the equation $z_1 - kz_2 = 0$, and, therefore, this is the equation of the curve passing through all intersections of the given curves. In the same way, equations of any degree may be represented and discussed.

The position of a point in space of three dimensions may be expressed in terms of its distances from three fixed planes. In this way the properties of spheres, ellipsoids, and other solids are expressed by equations. In space of four dimensions the coördinates of a point are (x, y, z, w), and in space of n dimensions $(x, y, z, \ldots .n$ quantities), although we cannot draw the figures.

The ellipse, hyperbola, and parabola being sections of a right circular cone, are known as *conic sections* (q.v.). They were chiefly investigated by purely geometric methods until the appearance of Descartes's *Discours* (1637). In the extensive development of analytic geometry since Descartes, a large number of coördinate systems have been introduced, the most important being the polar, generalized, homogeneous, Lagrangian, Eulerian, barycentric, and trilinear coördinates.

The most comprehensive English works are those by Salmon, *Treatise on the Conic Sections* (Dublin, 1869); *Higher Plane Curves* (1873); *Treatise on the Analytic Geometry of Three Dimensions* (Dublin, 1874). Other noteworthy works are: R. F. A. Clebsch, *Vorlesungen über Geometrie* (Leipzig, 1876); M. Chasles, *Traité de géométrie supérieure* (Paris, 1880); and among recent elementary works are those of Steiner, Briot, Bouquet, Townsend, and Scott. For a further discussion, see GEOMETRY and COÖRDINATES.

ANALYTIC JUDGMENT. In Kantian philosophy, a judgment in which the predicate is the definition (q.v.) or part of the definition of the subject. All other judgments are synthetic. The distinction between analytic and synthetic judgments is open to serious objections, if the distinction is to be made absolute. Concepts (q.v.) vary from mind to mind, and even in the same mind from time to time. To the laboratory chemist, perhaps the most essential mark in the concept water is expressed in the formula H_2O; i.e., water is conceived to be a chemical union of oxygen and hydrogen in definite proportions. But the non-scientific man may have a clear idea of what he means by water and can perhaps define his concept. In such a case the definition would not include any reference to oxygen and hydrogen. Thus, the judgment that water is a certain chemical combination of oxygen and hydrogen, while an analytic judgment for the chemist, may be a synthetic judgment for the person who has not yet studied chemistry. Analysis and synthesis in logic are concomitant aspects of the same operation; every analytic judgment may be viewed as at the same time synthetic, and every synthetic judgment is also analytic. Consult: E. Caird, *The Critical Philosophy of Immanuel Kant*, 2 volumes (New York and London, 1889). See also bibliography under ANALYSIS.

AN′ALYT′IC LAN′GUAGES. See PHILOLOGY.

AN′ALY′ZER. That part of a polariscope (q.v.) which is used for examining light after it has been polarized. (See LIGHT.) It may be a movable mirror, a plate of tourmaline, a doubly refracting crystal, or a Nicol prism. The latter is most frequently employed for this purpose.

ANAM′. See ANNAM.

ANAMALAI HILLS. A mountain chain in Southern India, in Coimbatore District, Madras. They are a continuation of the Western Ghats below the Palghat Pass, and contain several lofty peaks. Valuable teak forests are on their sides.

ANAM′ESITE. See BASALT.

ANAMIRTA, ăn′ȧ-mĭr′tȧ. See COCCULUS INDICUS.

ANAMMELECH, ȧ-năm′ĕ-lĕk. A god worshiped by the inhabitants of Sepharvaim, who were deported to Samaria (II. Kings xvii : 31). This city is probably identical with Shabaraïn, or Sibraim, near Damascus; and the deity may be Anath, the Syrian goddess, rather than Anu.

AN′AMO′SA. A city and county seat of Jones Co., Ia., about 40 miles (direct) southwest of Dubuque, on the Wapsipinicon and Buffalo rivers, and on the Chicago and Northwestern, the Chicago, Milwaukee and St. Paul, and other railroads (Map: Iowa, F 2). It is the seat of a State penitentiary. The city has a considerable trade in building stone. The industrial establishments include a school supply factory, flour mills, grain elevators, a foundry, a spade factory, carriage and wagon works, etc. Pop., 1900, 2891; 1905, 2878.

ANA′NAS. See PINEAPPLE.

AN′ANI′AS (Gk. Ἀνανίας). (1) One of the members of the young Church at Jerusalem who conspired with his wife, Sapphira, to make a false pretense respecting their gift of property to the community of the brethren, and was, with his wife, struck dead (Acts v: 1-11). (2) A disciple at Damascus (Acts ix : 10-17; xxii : 12) mentioned in connection with Saul's experience in that place. (3) A high priest at Jerusalem (Acts xxiii : 2; xxiv : 1) mentioned in connection with Paul before the Sanhedrin and at Cæsarea.

ANANIEV, or **ANANYEV,** ȧ-nän′yĕf. A town in the government of Kherson, Russia, about 220 miles northwest of Kherson, on the banks of the Tiligula (Map: Russia, C 5). Very little manufacturing is carried on, but there is some trade in agricultural products. It has a mixed population of Russians, Jews, and Rumans, numbering in all about 17,000 in 1897, as against 14,200 in 1885. Ananiev was annexed to Russia in 1792.

ANAPA, ȧ-nä′pȧ. A small seaport on the Black Sea, in the Kuban territory, Russia (Map: Russia, E 6). An old rampart, now serving as a promenade, is a feature of the town. A trade in grain and fish is carried on. Population, 1897, 6676. Founded as a fortress in 1771, Anapa was repeatedly attacked by the Russians in their wars with Turkey. It became Russian in 1829. In 1854, at the approach of the allied fleet, Russia evacuated it, after destroying its fortifications.

AN′APÆST (Gk. ἀνάπαιστος, *anapaistos*, struck back, i.e., a dactyl [q.v.] reversed, from ἀνά, *ana*, back + παίειν, *paiein*, to strike). The name of a measure, or foot, in Greek verse, consisting of two short syllables and one long syllable; thus ⏑⏑—. It has been called the marching rhythm, as the language of the chorus in Greek tragedy fell into anapæsts on entering or leaving the orchestra. It was also the prevailing measure in the parabasis of Aristophanic comedy. By analogy, the name is also employed to designate in modern verse a trisyllabic measure of two unstressed syllables followed by a stressed syllable; for example: "*I am món* | *arch of áll* | *I survey.*" See VERSIFICATION.

ANAPHRODISIACS, ăn-ăf′rō-dĭz′ĭ-ăks (Gk. ἀν, *an*, priv. + ἀφροδισιακός, *aphrodisiakos*, pertaining to Aphrodite, goddess of love). Substances used to lessen the sexual desire. In the first place, all causes of genital irritation should be removed. Careful cleansing should be insisted on, and in many cases circumcision is needed. Saccharine or highly acid urine should be corrected. Distention of the bladder should be avoided if possible. Vesical calculus, worms, hemorrhoids, and anal fissure may all act as causes of sexual excitement, and should be treated if present. Other rarer lesions in this neighborhood may cause it. Constipation should be relieved. The clothing, especially at night, should not be too warm. The bed should be hard. The diet should be restricted in amount, and chiefly vegetable; while spices and stimulants of all kinds should be avoided. Hard mental work and abundant exercise, especially with the arms, are strongly indicated. Ice, applied locally, and cold baths, local or general, are very potent in allaying sexual excitement for the time. Besides these measures, some drugs are of value. The best are probably the bromides. They should be given in full doses, and if necessary pushed to the physiological limit. Next to these comes camphor, which should be used in the same way. The nauseants are valuable temporary expedients, but cannot be used in a prolonged treatment. It must be remembered that nymphomania and satyriasis are due to cerebral conditions, and occur during attacks of insanity or during delirium produced by alcohol and other drugs.

ANARCHIDAS, ȧ-när′kĭ-d*a*s. See Wolf-Fish.

AN′ARCHIST (Gk. *ἀν*, *an*, priv. + *ἀρχή*, *archē*, power, sovereignty). One who believes that all authority, government, and control of one individual or group of individuals over another is necessarily evil.

Definitions. The word "anarchy," first used in its French form by Proudhon in an essay entitled *What is Property?* (1840), has served to designate a group of theories, some of them very old, and the best of them formulated in definite language by Proudhon and his personal followers. There are several definitions of anarchy representing different groups of anarchists: (1) Anarchy is the result of absolute individualism in thought as well as in social activity. This might be called idealistic anarchy. (2) Anarchy is an economic and social system whereby the individual is free to produce what he pleases, gets the full product of his labor, and is under no compulsion of social regulation or law in any of his economic relations to his fellows. This is Proudhon's theory, and while less idealistic than the first definition, was regarded by Proudhon himself as impossible of realization. He regarded a federation of small autonomous groups as the best attainable result in government. (3) Anarchy represents a communistic organization of individuals in society having perfect freedom and equality as between themselves in the production and consumption of goods, and offering a combined resistance to all existing forms of social order, law, and government. This definition covers anarchists of the Bakunin type, who have much in sympathy with some Socialists, though theoretically Socialism and Anarchism, in their main tenets and underlying philosophy, stand at opposite poles of thought. (4) Anarchy comprises all attempts to destroy the existing social order, without reference to any theory of reconstruction, and by the use of any means, fair or foul, by which individuals or institutions representing constituted authority may be destroyed. This represents the popular concept of all Anarchists. It describes the ultra-radicals, who are the uncompromising enemies of public order and decency, who plan murders and reckless public calamities. They are the fanatics who have been most in evidence in recent years.

History of the Theory. Greek philosophy, while in its main currents rather socialistic, and certainly constructive, was not without its representatives of extreme individualistic theory (Zeno, and among the early Christian philosophers, the Gnostics). A mystical theory of the rights of the individual, which resembles idealistic anarchy, was held by some of the Christian writers of the Middle Ages (Joachim, 1200; Amalric of Bène; the Adamites, 1421; Chelcicky, 1420; and others). The first modern writer of scientific repute is Godwin, who, in his *Political Justice* (1793), proceeds on the doctrine of natural rights, and regards all government as a sort of necessary tyranny, to be reduced to its lowest terms. This doctrine can be traced through a large number of writings, down to Herbert Spencer's ideas of liberty and the sphere of the State. Ideal anarchy, of the Proudhon type, is sometimes called scientific anarchy. Proudhon thought he saw in it the only way to free the laborer from the encroachments of the capitalist and to guarantee to every man the right to development. To Proudhon's mind anarchy was a step similar in motive but opposite in principle to the present efforts of State Socialists in the interests of labor and in opposition to monopoly. He was blind to all practical difficulties, and when he attempted to secure freedom of exchange, through a proposition to establish exchange banks in Paris, he failed utterly in practical plans. Proudhon's ideas found disciples in Germany in Moses Hess, who published *Philosophie der That* and *Sozialismus* (1843), and Karl Grün, both of whom developed the better side of Proudhon's teaching, and proposed needed radical reforms. In the United States, Proudhon's doctrine was taken up by B. R. Tucker, of Boston, who published a translation of Proudhon's *What is Property?* (1876), and *Economic Contradictions* (1888), and also a translation of Bakunin's *God and the State* (1883). Tucker edited a periodical entitled *Liberty*, which began publication in Boston in 1881, but was afterward removed to New York City. Individualistic Anarchism has always been the strongest in the United States. As pure egoism it became an immoral doctrine in the hands of a German school-teacher, Max Stirner, whose real name was Kaspar Schmidt (born at Bayreuth, Germany, 1806; died, 1857). Stirner had a large temporary following, but was soon forgotten.

Anarchistic Attempts. Anarchism as a political movement began with Bakunin (q.v.), who tried to incite the working classes throughout Europe to organized rebellion against all law and government, and to resistance by force against all authority. With this movement began anarchist communism, with which the philosophical and individualistic Anarchists will have nothing to do. In its theoretical aspects anarchistic communism has been developed by Reclus and Prince Krapotkin (q.v.), both noted travelers and explorers, who have, however, frequently denounced bomb-throwers and attempts to assassinate rulers. Since the year 1886 there have been numerous outrages and assassinations committed by those calling themselves Anarchists. Usually these have been the acts of individuals, not the results of any general conspiracy.

United States. America has witnessed but two such outrages. The first was the famous Haymarket explosion at Chicago on May 4, 1886. This occurred at a large assembly of workingmen. The speakers began uttering revolutionary sentiments, and the gathering was ordered to disperse by the police. An unknown person threw a bomb, killing seven policemen and wounding sixty. In the mêlée following, some workmen were killed and others wounded. For this seven were condemned to death, and one (Neebe) to fifteen years' imprisonment. Ling committed suicide the day before the time set for the execution. Spies, Parsons, Fischer, and Engel were hanged November 11, 1887, the sentences of Schwab and Fielden having been commuted to life imprisonment. Later Governor Altgeld pardoned Neebe, Schwab, and Fielden. The second was the murder of President William McKinley, at Buffalo, N. Y., September 6, 1901, by Leon F. Czolgosz, who was executed by electricity October 29, 1901. As a result of the ensuing agitation against anarchism, a law was enacted by Congress in 1902 excluding anarchists from the classes permitted to immigrate into the United States.

Europe. England has been entirely free from these outrages, the nearest approach being a riot at Trafalgar Square, London, November 13, 1887.

The Continent of Europe has not fared so well. In March, 1892, there was a series of explosions in France. For one of these Ravachol was executed (June 11, 1892), and others imprisoned. A plot to blow up the Paris Bourse was frustrated. Manifestos urging armed uprisings were issued by anarchists. There were serious disturbances and explosions in Spain and Italy. In February, 1893, bombs were exploded at Rome. At Barcelona, on September 23d, a bomb was thrown into a group of staff officers at a military review, which wounded several officers, one of whom was Captain-General Martinez Campos, and killed one guard. For this, Codina and five accomplices were shot May 21, 1894. A general conspiracy was unearthed at Vienna, September 23d. On November 7th a bomb was thrown into the pit of a Barcelona theatre, which killed thirty and wounded eighty. Salvada French was executed for this crime. On December 9th, at Paris, during a session of the Chamber of Deputies, a bomb was thrown from the gallery. A woman, perceiving the intentions of the thrower, grasped his arm, causing the bomb to strike a chandelier and explode harmlessly. Vaillant, whose real name was Königstein, a man of German descent, was immediately identified as the thrower, and was executed January 10, 1894, his last words being "Vive l'anarchie!" The French Government had previously passed a law making such attempts capital offenses, even though no one was killed. A week after the execution of Vaillant, and in revenge for his execution, a man named Emile Henry exploded a bomb in the café of the Hôtel Terminus, severely wounding many guests. Henry was executed May 21, 1894.

There were outrages at Marseilles and other cities. An infernal machine was sent to Count Caprivi, the imperial German Chancellor and Foreign Minister. In March, 1894, a bomb exploded before the Chamber of Deputies at Rome, but did no great harm. On June 16th an attempt was made on the life of Crispi. For this Paul Fega was sentenced to twenty years' imprisonment. President Carnot of France was assassinated June 24th by an Italian Anarchist, Santo Caserio. He died the following day. Caserio was guillotined August 15th. A plot against the French Premier Dupuy was frustrated. Active measures were taken against the anarchists, particularly in Italy, where some 2000 suspects were arrested during the summer. The year 1895 was comparatively quiet. In 1896 eleven were killed and forty wounded by an explosion at Barcelona. For this, which was the result of a conspiracy, five men were shot, thirteen imprisoned for over ten years, and seven for less than ten years. The premier of Spain, Señor Cánovas del Castillo, was assassinated August 8, 1897, by an Italian, Michele Angiolillo, who was executed eleven days after the crime. On September 10, 1898, the Empress of Austria was assassinated in Switzerland by an Italian, Luccheni, who had come thither intending to kill the Duke of York, but, not finding him, vented his fury upon the Empress. Luccheni was immediately apprehended and sentenced to solitary confinement for life. The death of the Empress caused the summoning of an anti-anarchist conference, attended by representatives of the various governments. The sessions were held at Rome, November 24th to December 21st. The results were not made public. King Humbert of Italy was assassinated July 29, 1900, by a countryman, Angelo Bresci. Bresci had been living in America, and went to Italy intending to assassinate the King. The murderer was sentenced to life imprisonment. On May 31, 1906, the wedding day of Alfonso XIII. of Spain and Princess Ena of Battenberg, a bomb was exploded near the royal carriage on its way from the church at Madrid where the marriage was performed. About twenty persons of the royal escort were killed.

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AN'ASTA'SIA (?-597). A Greek saint. Her beauty attracted the Emperor Justinian, and in order to escape his dishonorable attentions she retired to Alexandria, where she lived twenty-eight years, disguised as a monk. The date of her commemoration is March 10th.

ANASTASIA, SAINT. A Christian martyr, slain during the reign of Nero (54-68 A.D.). She is said to have been a pupil of St. Peter and St. Paul. The date of her commemoration is April 15th.

ANASTASIA THE YOUNG'ER. A noble Roman woman who suffered martyrdom during the Diocletian persecution (303 A.D.); the wife of Publius, a pagan, who informed against her as a Christian. Two letters written by her in prison are preserved in Suidas. The Greeks commemorate her as a saint on December 22d; the Latins, on December 25th.

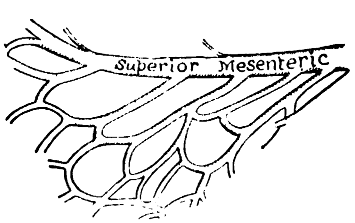
AN'ASTA'SIUS I. (c. 438-518). Emperor of the East. He was proclaimed emperor at Constantinople on the death of Zeno, in 491. He was a native of Dyrrachium, but had spent most of his life in public office at Constantinople. He was about fifty-three years old at his accession, and was noted for his ability, integrity, and justice. "Reign as you have lived" was the cry with which he was greeted on his first public appearance. He married the widow of Zeno, but had no children. His reign was troubled by local revolts, by a war with Persia in 503-505, and by invasions of Huns, Slavs, and Bulgarians. To check the last, Anastasius built, in 512, the wall which bears his name, 35 miles west of Constantinople. Yet his reign was a very prosperous one. He was unpopular with some, because he was suspected of being addicted to the Monophysite heresy (q.v.); with others, because he was thought to be too puritanical. He suppressed gladiatorial combats with wild beasts and licentious dances. He erected fortresses on the boundaries, restored ruined cities, suppressed some of the most obnoxious taxes; yet he left the treasury, which he had found empty, filled with 320,000 pounds of gold: and a well-disciplined army of 150,000 men. He preserved the Empire intact, having governed it wisely, leniently, and justly.

ANASTASIUS II. (died 719?). Emperor of the East, elected to the throne of Constantinople by the Senate and people in 713. He organized a formidable naval force, which mutinied at Rhodes and proclaimed Theodosius, a low person, emperor. Theodosius took Constantinople six months later, and deposed Anastasius (716), who escaped to Thessalonica and became a monk. He was a man of wisdom and experience, who attempted various reforms, and thereby excited the wrath of many who saw their person or property endangered.

ANASTASIUS. The name of four popes and one antipope.—Anastasius I., Pope from 398 to about 402. He healed an unseemly strife at Rome by ordering the priests as well as the deacons to stand bowed while the Gospel was read in the Church service. He was vehemently opposed to the doctrines of Origen, one of whose works (*Peri Archon*, i.e., *Concerning Principles*) he condemned as heretical. He is praised by Jerome, who calls him a man of a holy life, of a "rich poverty," and of an apostolic earnestness. He died December, 401, or April, 402. His letters and decretals are in Migne, *Patrol. Lat.*, xx.—Anastasius II., Pope from 496 to 498. He was born in Rome; consecrated Pope November 24, 496. He endeavored to heal the breach with the Eastern Church, but the attempt was so ill-judged that Dante puts him in hell. He died in November, 498. Two genuine letters of his are extant, one informing Emperor Anastasius of his accession, the other congratulating Clovis on his conversion to Christianity.—Anastasius III., Pope from 911 to 913. He was born in Rome. —Anastasius IV., Pope from 1153 to 1154. He healed two important ecclesiastical quarrels by recognizing Wichmann as Archbishop of Magdeburg, and William as Archbishop of York. He died in Rome December 3, 1154. His letters are in Migne, *Patrol. Lat.*, clxxxviii.—The Antipope Anastasius was opposed to Benedict III. in 855, but speedily degraded.

ANASTASIUS THE LIBRA'RIAN (Bibliothecarius) (?-886). A librarian of the Vatican, and abbot of Sta. Maria Trans-Tiberim, Rome. He was present in 869 at the eighth Council of Constantinople, whose canons he translated into Latin. He wrote a *Historia Ecclesiastica* (edited by Fabretti, 1649), and the *Liber Pontificalis*, biographies of the popes from St. Peter to Nicolas I.

ANAS'TOMO'SIS (Gk. ἀναστόμωσις, an opening of the mouth, from ἀνά, *ana*, again + στόμα, *stoma*, mouth). An anatomical term used to express the union of the vessels which carry blood or other fluids, and also, for convenience' sake, the junction of nerves. The veins and lymphatics anastomose to form large single trunks as they approach their ultimate destinations. The arteries break up into small branches, for the supply of the tissues, and each small vessel again communicates with others given off above and below. At each large joint there is a very free anastomosis, so that the safety of the limb beyond may not be entirely dependent on the single arterial trunk passing into it, exposed as it is to all the obstructive influences of the different motions of the limb. After the main artery has been permanently obstructed, the anastomosing vessels enlarge, so as to compensate for the loss; but after a time, only those whose course most resembles the parent trunk continue enlarged, and the others gradually regain their ordinary dimensions.



ARTERIES ANASTOMOSING.

AN'ATASE. See Octahedrite.

ANATH'EMA (Gk. ἀνάθεμα, or ἀνάθημα, *anathēma*, that which is set up, offered, or dedicated, from ἀνά, *ana*, up + τιθέναι, *tithenai*, to put, set, place). A word originally signifying some offering or gift to Deity, generally suspended in the Temple. Thus, we read in Luke xxi : 5 that the Temple was adorned "with goodly stones and gifts" (*anathemasi*). It also signifies a sacrifice to God; and, as the animals devoted to be sacrificed could not be redeemed from death, the word was ultimately used in its strongest sense, implying eternal perdition, as in Romans ix : 3, Galatians i : 8-9, and other places. In the Catholic Church a distinction has been made between excommunication and anathematizing; the latter being the extreme form of denunciation against obstinate offenders. The synod of Elvira (306) anathematized those who placed libelous writings in the Church and those who read them; the Nicene Council (325), the Arians; and so later councils and synods those who seriously offended. Thus that of Paris (846) forbids anathematization, on account of its being a "condemnation to eternal death," to bishops without the consent of their archbishop and fellow bishops.

AN'ATHOTH. A town in Palestine, two and one-half miles northeast of Jerusalem, and one of the places assigned to the Levites (Joshua xxi: I. Chronicles vi : 60). It was the birthplace of Jeremiah (Jeremiah i : 1), as well as the home of Abiathar, the high priest (I. Kings ii : 26). of Abiezer (II. Samuel xxiii : 27), and of Jehu (I. Chronicles xii : 3), all prominent in the days of David. The name appears to be the plural of Anat, and it is of some significance to note that there was a goddess Anatum in Babylonia, the consort of the sky-god Anu, though the evidence is not sufficient to assume a connection between the supposed worship of this goddess in Canaan and the Babylonian goddess. It was an important place, being reoccupied after the exile (Ezra ii : 23; Nehemiah vii : 27). On its site stands at present the little village of Anata, at the top of a hill commanding a view of the Dead Sea. Building stones for Jerusalem are still supplied from a quarry at Anata. It was at Anathoth that Jeremiah bought a field, as a symbol of the assured return from the Babylonian captivity (Jeremiah xxxii : 7).

ANAT'IDÆ (Lat. *anas*, duck). The family of ducks, geese and swans (qq.v.) See Anseres.

AN'ATO'LIA (Gk. Ἀνατολή, *Anatolē*, a rising, east, i.e., from Constantinople; from ἀνά, *ana*, up + τέλλειν, *tellein*, to make to arise, to rise). The modern name for Asia Minor; Turkish, Anadoli. It embraces the western peninsula of Asia, bounded by the Armenian highlands on the east, Syria and the Mediterranean on the south, the Ægean Sea on the west, and the Black Sea and the Sea of Marmora on the north. Its area is 193,590 square miles (Map: Turkey in Asia, D 3).

It constitutes the western prolongation of the high table-land of Armenia, with its border mountain ranges. The interior consists of a great plateau, or rather series of plateaus, having an average elevation of about 3000 feet, with bare steppes, salt plains, marshes, and lakes; the structure is volcanic, and there are several conical mountains, one of which, the Argish (or Ergish) Dagh (Argæus), with two craters, rises about 10,000 feet above the plain of Kaisariyeh, which has itself an elevation of between 2000 and 3000 feet. The plateau is bordered on the north by a long train of parallel mountains, which skirt the coast of the Black Sea, and extend all the way to the Mediterranean, and which are cut up into groups by cross valleys. These ranges vary greatly in height, the greatest elevation in the extreme east being about 12,000 feet. They sink abruptly down on the north side to a narrow strip of coast; their slopes toward the interior are gentler and bare of wood. Similar is the character of the border ranges on the south, the ancient Taurus, only that they are more uniform and on the average much higher, although their loftiest summits do not rise above the highest peak of the northern mountains. The western border is intersected by numerous valleys, opening upon the Archipelago, through the highlands of the ancient Caria, Lydia, and Mysia, to the northern part of which mounts Ida and Olympus belong. Between the highlands and the sea lie the fertile coast lands of the Levant. The western coast of Anatolia is remarkably indented and fringed with the islands of the Archipelago. The rivers of Anatolia are not navigable; the largest are the Yeshil-Irmak (Iris), the Kizil-Irmak (Halys), and the Sakariah (Sangarius), flowing into the Black Sea; and the Ghediz-Tchai (Hermus), and Menderes (Mæander), into the Ægean. The largest of the salt lakes are Tuz-Tchöllü, Bei-Shehr, and Egerdir.

The climate bears on the whole a south European character; but a distinction must be made of four regions. The central plateau, nearly destitute of wood and water, has a hot climate in summer and a cold one in winter; the southern coast has mild winters and scorching summers; while on the coast of the Ægean there is the mildest of climates and a magnificent vegetation. On the northern side the climate is not so mild as on the western; yet the vegetation is most luxuriant, and a more delightful or richer tract than the coast from the Sea of Marmora to Trebizond is hardly to be found. The whole peninsula is subject to earthquakes.

In its flora and fauna, Anatolia forms the transition from the continental character of the East to the maritime character of the West. The forest trees and cultivated plants of Europe are seen mingled with the forms peculiar to the East. The central plateau, which is barren, except when assisted by irrigation, has the character of an Asiatic steppe, more adapted for the flocks and herds of nomadic tribes than for agriculture; the southern and western coasts, on the contrary, are characterized by a luxuriant vegetation, which includes the southern fruits of Europe with a slight admixture of the tropical plants of Africa.

The minerals of Anatolia are of considerable variety, including coal, lead, manganese, copper, meerschaum, and a few others. Salt and petroleum also exist, but are not exported to any extent. The agricultural products include the common grains, fruits in great variety and abundance, tobacco, cotton, and poppy-seed. Much silk is produced. Among the exports are prunes, figs, olives, poultry, eggs, skins, cattle, carpets, silk, gums, wax, and minerals. Transportation facilities are still inadequate and the railroads have (1903) a total length of 1472 miles.

The population of Anatolia, according to recent estimates, is over 9,089,200, composed of a number of different races. The Turks are found all over the country, in which they occupy the foremost position, both in commercial and in political life. The Turkomans, who are akin to the Turks, are mostly nomadic. The Greeks and Armenians constitute a considerable fraction of the population, and commerce is to a great extent in their hands. Among other elements in the population are Kurds, Yuruks, Lazes, Jews, Circassians, and Bulgarians. It is estimated that about four-fifths of the inhabitants are agriculturists or herdsmen. Among the cities of Anatolia are Smyrna, Scutari, Brussa, Kaisariyeh, Adana, Konieh, Sivas, Manissa (Magnesia), Aidin, Trebizond, Amasia, Tokat, Angora, Adalia, Ismid, and Kutaieh.

This region was an early seat of civilization. The country has passed under the supremacy of one race after another, and it has been the scene of numerous wars, both in ancient and in modern times. The west coast was early lined with opulent Greek cities, the seats of poetry, learning, and the arts, and great centres of colonization. In the first half of the sixth century B.C. the kingdom of Lydia, under Crœsus, attained the height of its splendor. Crœsus was conquered by the Persians, who extended their sway over the whole peninsula. The rule of Macedon succeeded that of Persia. After the disruption of Alexander's empire the Seleucid kings of Syria were dominant in Asia Minor. By the side of the Seleucid realm, various states arose in the peninsula, Pergamon, Bithynia, Cappadocia, and Pontus. The Romans first carried their arms into Asia Minor at the beginning of the second century B.C., when they vanquished Antiochus the Great of Syria. In the following century Pontus was a mighty realm under Mithridates the Great, who succumbed to the arms of Pompey. After 395 A.D. Asia Minor formed part of the Greek, or Byzantine, Empire. Under the Byzantines, it received the name of Anatolia. In the eleventh century the Seljuks made themselves masters of the region, where they established the sultanate of Rum. The close of the thirteenth century witnessed the beginnings of the power of the Ottoman Turks, who in the course of the following century established their sway over Asia Minor, which now became a great base whence Mohammedan conquests were carried on in Europe. Since 1453 the Ottoman Turks have ruled Anatolia from Constantinople. The ancient divisions of this region were Pontus, Paphlagonia, Bithynia, Galatia, Lycaonia, Phrygia, Cilicia, Caria, Pisidia, Pamphylia, Cappadocia, Mysia, and Lydia.

Consult: Percy, *The Highlands of Asiatic Turkey* (London, 1901); Oberhummer and Zimmerer, *Durch Syrien und Kleinasien* (Leipzig, 1898); K. Kaunenberg, *Kleinasiens Naturschätze* (Berlin, 1897); J. Bryce, *Trans-Caucasia and Ararat* (London, 1896); H. C. Barkley, *A Ride Through Asia Minor and Armenia* (London, 1891).

ANAT'OMY. The science that treats of the structure of organic forms; so called from dissection (Gk. ἀνά, *ana*, apart + τέμνειν, *temnein*, to cut), formerly the sole method of investigation. It is distinguished as Human, Animal, or Plant Anatomy, according to the organisms under consideration; as Normal or Pathological Anatomy according as these are in health or diseased; as Macroscopic or Gross Anatomy when it deals with structure visible to the naked eye; and as Microscopic or Minute Anatomy when the microscope is used as a means of research. This last division is often more aptly called General Anatomy because of its generalization, or histology, in view of the delicate webs of structure or tissues (ἱστός, *histos*, web) it investigates. Comparative Anatomy involves a comparison of the different forms of animals and plants, and Developmental Anatomy or Embryology an account of the different forms assumed by a single individual during its growth.

Other designations applied to anatomy have reference to its application. Dissection and the preparation of anatomical specimens is often called Practical Anatomy; the arrangement of the facts of structure according to their bearing upon the diagnosis and treatment of disorders is Applied Anatomy, which may be divided into Surgical Anatomy, that deals with structure accessible for surgical operations, and Medical Anatomy, that relates to structure which can be reached only indirectly. Physiological Anatomy gives the facts of structure that explain the function of organs; Artistic or Plastic Anatomy gives such facts as may be useful to the artist or the sculptor; Plastic Anatomy is a term sometimes used to designate the teaching of the science by means of artificial models composed of separable parts. The consideration of the deeper relations and causes of structure is called Philosophical Anatomy, or Morphology, and a purely speculative or theoretical disquisition of this kind is termed Transcendental Anatomy.

Anatomy may be treated in two different ways: as Descriptive or Systematic Anatomy, that arranges the facts of the science with reference to the structural affinities of organs forming the systems of the body, or as Topographical or Regional Anatomy, that considers the organs merely with reference to their exact situation and relations to each other. Descriptive Anatomy is usually subdivided into Osteology, that treats of the osseous system; Syndesmology, that treats of the ligaments; or Arthrology, that considers the ligaments and joints; Myology, that treats of the muscles; Neurology, of the nerves; Angeiology, of the vessels; Splanchnology, of the viscera.

HISTORY.

The knowledge of anatomy possessed by the ancients was slight. The importance of exact information not being generally recognized, and the dead body being held especially sacred, examination of the cadaver was rare, and attended with great difficulties. It is among the Greeks that the first traces of the science are found. Hippocrates (460-360 B.C.) and his school appear to have had some knowledge of the skeleton and of the larger viscera; Aristotle (384-323 B.C.) examined a large number of animals, and had some remarkably just ideas as to their genetic relationships: Herophilus (c. 300 B.C.) and Erasistratus of Alexandria investigated the vessels and the glandular organs. At the Alexandrian School, dissection was first publicly practiced, and there a considerable advance was made in the knowledge of the human body. Only fragments of the writings of this time have come down to us. Herophilus described the sinuses of the dura mater, the retina, the lacteals, and the lymphatics, and admitted that the arteries contained blood, his predecessors having held that, like the air-tubes of the lungs, they normally carried air during life. Erasistratus considered the brain as an organ for the transformation of the "vital spirits" received from the air into "animal spirits," and distinguished between nerves of motion and those of sensation.

The prejudice against dissection appears to have finally overcome the progress achieved by the Alexandrian School, and the belief became current that the healing art depended upon metaphysical conditions impossible to elucidate by an examination of structure. The next considerable advance was made by Claudius Galen (q.v.) of Pergamus (131-201 A.D.), who compiled much from Celsus and others, and was the author of the first systematic treatise that has come down to us. He appears to have examined apes rather than man, but correctly described most of the bones, joints, muscles, cranial and spinal nerves, and many features about the brain and its membranes. He performed a great service for anatomy by clearly and exactly describing what he had actually inspected and by recording his observations in a methodical manner. These very merits, however, caused the almost universal acceptance of his erroneous physiological speculations, which gave rise to false ideas of the structure of the circulatory apparatus that prevailed until the middle of the seventeenth century. He taught that after digestion, food is carried to the liver by the portal vein, and there converted into crude blood having nutritive properties due to "natural spirits;" that from the liver it passes to the right side of the heart, where a portion enters the venous system, in which it ebbs and flows, affording nutrition to the body, another portion passing through invisible pores in the septum of the heart to its left side, where it becomes mixed with air drawn in from the lungs by the pulmonary veins, and thus receives the "vital spirits," and is freed from impurities (fuliginous vapors) by the "innate heat" of the heart; thus vitalized and clarified, it passes into the arterial system, in which it also has an oscillatory motion, endowing the body with the higher functions of life, while in the brain it is further elaborated to "animal spirits" that are conveyed throughout the body by the tubular nerves to impart movement.

The irruption of the northern barbarians arrested all attempts at scientific research, and it was not until after the renaissance of letters and science at the hands of the Arabs, who resuscitated the learning of the ancient Greeks, that further advances were made. At Salerno and Montpellier active medical schools were established, and some attempt was made to revive the study of anatomy. Frederick II., Emperor of Germany (1215-50), is said to have forbidden anyone to practice surgery without a competent knowledge of anatomy, and to have provided that every five years there should be held at Salerno a public dissection, to which physicians and surgeons from all parts of the Empire were invited. At Montpellier the cadavers of criminals were regularly dissected. The Senate of Venice decreed in 1308 that a human body should be dissected annually. Doubtless autopsies were occasionally held to determine deaths by poisoning, which were not infrequent at this period. At the University of Bologna, Mundinus dissected several bodies publicly, and published, in 1315, an imperfect little handbook based upon Galen and Arabian authors. At Prague dissection was practiced from the very foundation of the University (1348), at Vienna as early as 1404, at Tübingen from 1482, and at London from 1540. At Padua (1490) Benedetti erected an anatomical amphitheatre, and made public demonstrations. Somewhat later Berengarius of Carpi is said to have dissected more than a hundred cadavers. Vidius, from whom the Vidian nerve and Vidian canal are named, professor at Pisa, Guintherius of Andernach (1487-1574), professor at Louvain, and Jacobus Sylvius (1478-1555), professor at Paris, as well as many others, dissected from time to time. There was, however, nothing like a careful and systematic examination of the structure of the body. It was considered sufficient to open the great cavities and display the viscera, which were examined in the most superficial manner. Great reliance was placed upon Galen and Hippocrates, supplemented by their Arabian commentators, and their authority was rarely questioned.

Andreas Vesalius (1514-1564) (q.v.) of Brussels was the first to proclaim openly the new doctrine, that the structure of man should be learned by a thorough inspection of the human body rather than by reference to ancient authorities. He dissected frequently in public at Padua, Pisa, and Verona, and published, in 1543, his great work, *De Humani Corporis Fabrica*, the first careful and complete description of the body of man based upon actual observation. This work was illustrated by excellent plates made by Stephen von Calcar, a pupil of Titian. Many of Galen's errors were corrected, and the student was urged again and again to verify each statement by reference to the only prime authority, the body of man itself.

A storm of opposition was at once raised. Sylvius, a pronounced Galenist, declared Vesalius to be an impious madman, whose breath poisoned Europe, and he strove in every way to discredit his work. Others, more rational in their opposition, pointed out errors in Vesalius's own book. The ardent young Fleming, impatient and chagrined at this, resigned his chair at Padua, and retired to the court of Philip II., at Madrid, where he tried to continue his studies. His enemies did not scruple to attempt to rouse the Inquisition against him. Philip interrogated the faculty of the University of Salamanca, then the leading theological school in Europe, as to whether dissection was permissible. After due deliberation a reply was given, that since a knowledge of anatomy is useful to man, dissection may be allowed (1556).

The atmosphere of the Spanish court was far from congenial to scientific pursuits. Vesalius contemplated a return to Italy; but coming back from Palestine, whither he had gone, as is supposed, in fulfillment of some vow, he was shipwrecked, and died on the island of Zante. He was the founder of modern anatomy in the sense that he broke with tradition and substituted actual investigation for reliance on authority.

The contemporaries and successors of Vesalius aided much in placing Gross Anatomy upon secure and lasting foundations. The most illustrious among these were Eustachio (c. 1520-74) (q.v.), Fallopio (c. 1523-62) (q.v.), and Fabricius (1537-1619).

Eustachio made many corrections of the work of Vesalius, and was besides an original investigator of great force. From plates prepared by him (but not published until the eighteenth century), it appears that he anticipated many discoveries ordinarily ascribed to anatomists of a later period; but the Eustachian tube, which he accurately described, is said to have been previously discovered by Alcmæon about 500 B.C.

Fallopio named the Fallopian tubes (previously discovered by Herophilus) and the seminal ducts, and gave a good description of the organ of hearing, discovering in the temporal bone the aqueduct and hiatus that commonly bear his name.

Fabricius of Aquapendente erected at Padua an anatomical amphitheatre. He studied the development of the fœtus and of the embryo chick, described the muscular coat of the alimentary canal and of the bladder, and especially the valves of the veins first discovered by Stephanus of Paris in 1545 and in some situations figured by Vesalius in the second edition of his work. Fabricius supposed that they were for the purpose of retarding the oscillatory flow of the venous blood.

It fell to a pupil of Fabricius, William Harvey, to explain them more satisfactorily, and to free anatomy from some of the false notions that survived from the Galenical teaching. From about 1615 to 1628 Harvey demonstrated by public lectures and by published experiments the true circulation of the blood. The lesser or pulmonary circulation had been mentioned by Servetus in 1553 in an obscure pamphlet, and by Realdus Columbus in 1559, but was not generally accepted. Cæsalpinus, in some controversial works published in 1571 and 1593, suggested the probability of a systemic as well as of a pulmonary circulation, and was the first to use the term *circulatio* in this connection. Yet the Galenical theory of the oscillatory movement of the two kinds of blood and the necessary supposition of orifices in the septum between the cavities of the heart were still taught. Vesalius, it is true, had said that he could not find the orifices, and somewhat satirically wondered at the wisdom of the Almighty, who had made them so small that they could not be seen. Harvey, to use his own words, "taught anatomy, not from books, but from dissections; not from the suppositions of philosophers, but from the fabric of Nature," and in a series of most carefully conducted investigations and vivisections succeeded in showing that the blood makes a complete circuit of the body as well as of the lungs. Harvey's work led to a more careful examination of the heart and blood vessels. Stephen Blancaard, in 1675, first effectively demonstrated the finer vessels by injection, a method used by Frederick Ruysch (1638-1731) to show their presence in great numbers in almost every part of the body. The lymphatics, casually seen by several ancient observers, were first carefully studied by Caspare Aselli in 1622. The thoracic duct, discovered first by Eustachius in the horse, was seen in the dog by Pecquet (1622-74) and traced through the diaphragm to the *receptaculum chyli*. It was first observed in man by Jan van Horne (1621-70), professor at Leyden.

Still under the hallucination caused by the Galenical theories, anatomists thought that both lacteals and thoracic duct could be traced to the liver. Rudbeck discovered the general lymphatics in 1651.

A clearer idea of the gross anatomy of the brain, especially of its internal cavities, was due to the descriptions of Francis Boë (Du Bois), usually known as Franciscus Sylvius (1614-72), professor at Leyden, whose name survives in the aqueduct, fissure, fossa, and artery of Sylvius. The science of chemistry was at this time gradually emerging from the superstitions of alchemy, and Sylvius is also famous for being among the first to attempt to differentiate the structures and fluids of the body by means of their chemical reactions. Vieussens (1641-1715) of Montpellier also increased the knowledge of the nervous system, both central and peripheral, describing the anterior pyramids, the olive, and the anterior medullary velum which sometimes bears his name. To Thomas Willis (1622-75) (q.v.) of London, sometime professor at Oxford, is due a systematic description of the brain and its cavities, together with a classification of the cranial nerves in which he finally separated the sympathetic cord from that series. He recognized that the brain becomes gradually more complicated as we ascend the animal scale, and that it is more easily understood by a study of the lower and more simple forms. The decussation of the pyramids was first described by Duverney (1648-70), demonstrator at the Jardin du Roi, afterward the Jardin des Plantes, at Paris. The doctrine of the "animal spirits," supposed to fill the ventricles of the brain and to be distributed by the nerves, was first seriously attacked by Wepffer (1658).

The advance of the physical sciences instituted by Galileo (1564-1642) had a profound effect upon anatomy. The new developments in optics were now called on to contribute to the problems of structure. The optical properties of the crystalline lens were now described by Kepler (1571-1630) (q.v.), the eminent astronomer, who denied that it is the seat of vision as supposed by Hippocrates; the image on the retina was demonstrated by Scheiner (1575-1650); Descartes (1596-1650) showed the eye to be a camera obscura, and suggested that accommodation is produced by a change in the convexity of the lens. He also made some very acute observations on the structure and functions of the nervous system, marred, however, by metaphysical speculations that were attacked by Stensen, who declared that in order to determine the functions of organs we must first ascertain their structure.

A new instrument of research which the Italians, impelled by the zeal imparted by Galileo, were the first to apply to scientific uses, was now introduced. This was the microscope, hitherto merely an optical curiosity. The magnifying power of convex lenses was known to the ancients, for even in the ruins of Nineveh a polished rock crystal lens has been found, and there is good reason to believe that similar instruments were used in ancient Egypt and in Greece. Spectacles were used in Europe as early as the thirteenth century, and the compound microscope was invented about 1590 by Hans and Zacharias Janssen of Middelburg, Holland. No means for correcting chromatic and spherical aberration being then known, the first instruments were clumsy and imperfect; consequently, many investigators preferred to use the simple microscope, especially after Leeuwenhoek had shown what excellent results could be obtained with small but accurate lenses.

Among the first and most acute observers was Marcello Malpighi (1628-94), professor at Bologna, Pisa, and Messina, a man of extraordinary acuteness of intellect, combined with an indomitable zeal for natural research. He left his mark in almost all departments of biology. He was an accomplished botanist, and by his researches among plants laid the foundations of the modern cell-theory; he was an entomologist, devoting himself to an exhaustive study of the anatomy and development of the silk-worm; he was an embryologist, being the first to build upon the incomplete studies of Harvey and Fabricius and describe adequately the changes of the chick in the egg; he was a pathologist, studying carefully post-mortem appearances and the causes of disease; he was also a comparative anatomist, drawing many of his conclusions as to the structure of man from an examination of animals.

Before Malpighi's time but little was known regarding the structure of glands. Under this designation were included many non-glandular organs, like the tongue and the brain, the latter being supposed to secrete not only the animal spirits but the nasal mucus or *pituita* which was believed to pass down through holes in the cribriform plate of the ethmoid bone. Sylvius had, it is true, distinguished as conglomerate glands aggregations like the pancreas and the salivary glands, and as conglobate glands those of the lymphatic system. The ducts of some of the larger glands were unknown, the liver was considered a great blood-making organ that received the bile elaborated by the gall-bladder for the purpose of combining it with the blood, and the mechanism of secretion was wholly misunderstood. Wirsung discovered the pancreatic duct in 1642, but supposed it to be a lymphatic leading to the liver; Wharton described the submaxillary duct in 1652; Steno, the parotid duct (previously thought to be a tendon) in 1661; Bartholin the sublingual duct; Bellini the straight tubules of the kidney in 1662; Peyer the closed follicles of the intestines in 1677, and Brunner the duodenal glands in 1682. Schneider (1614-80), professor at Wittenberg, finally described the pituitary membrane of the nasal passages and settled the origin of the nasal mucus. It was Malpighi, however, who first united these scattered observations and gave a clear idea of the structure of acinous glands. It was during his researches on this subject that he discovered the acinous structure of the lung, and demonstrated that there are no visible orifices by which air can pass from the vesicles into the pulmonary veins. Here, too, he first observed, in the lung of the frog, the capillary blood vessels "distributed in a ring-like fashion," thus justifying Harvey and forever settling the question of the circulation of the blood. He described most of the structure of the kidney as it is known to us to-day, and in the spleen discovered the bodies that bear his name. He saw and described the red blood corpuscles, unaware that they had been previously discovered by Swammerdam, a Dutch anatomist, in 1658. Extending his researches to the skin, he discovered the rete mucosum, or Malpighian layer, and the papillæ, which he surmised were organs of touch. He elucidated the structure of the liver, which Glisson (1597-1677), professor at Cambridge, had already carefully described, showing that it is an acinous gland of peculiar construction, and, by tying the bile duct, demonstrated that the bile is formed in the liver and not in the gall-bladder.

As a consequence of the increase of the power of vision by the use of the microscope, the phenomena of fecundation and the development of the embryo began to receive attention. Spermatozoa were discovered in 1677 by a pupil of Leeuwenhoek, and De Graaf, discovering the ovisacs (Graafian follicles) about 1672, supposed them at first to be ova. Naboth, too, discovering the closed follicles of the neck of the uterus, supposed them to be ova (*Ovula Nabothi*). The ova of the lower vertebrates were, of course, well known, and the phenomena of their development were specially investigated by Malpighi. Van Horne, of Leyden, probably saw the human ovum in 1668, but it was not unmistakably recognized until Von Bär demonstrated it in 1827.

During the course of this investigation two schools arose—the Animalculists and the Ovists, that respectively maintained the superior efficacy of the male or female elements. Attempts were made to explain the transmission of hereditary qualities from parent to child. Aristotle, having studied the development of the egg, had declared that the embryo primitively consisted of simple, undifferentiated material, from which, by successive stages, the adult was formed (theory of post-formation or epigenesis). Opposed to this was another contention, that either the male or the female elements must possess in miniature all the organs of the adult (theory of preformation).

A further result of microscopic research was an enlarged view as to the distribution of living things. The discovery by Leeuwenhoek (1632-1723) that organic infusions soon become replete with living forms when exposed to the air, led to the revival of the ancient notion of the spontaneous generation of living from non-living matter. This led to fanciful theories regarding fecundation that were not overthrown until Spallanzani (1729-99) showed that living forms do not develop in infusions that have been boiled and then excluded from the air, and that filtered seminal fluid has lost the power of impregnation. Following up the researches of Hartsoeker (1656-1725) he also demonstrated that ordinary air teems with living particles that enter the human body and pass into infusions. This doctrine was termed panspermatism, and developed afterward into the modern "germ theory," which has had a profound influence upon pathological anatomy.

The following discoveries of this period may be briefly noted: Ole Worm (1588-1654), professor at Copenhagen, discovered the intercalary bones of the skull; Clopton Havers of England, in 1692, the Haversian canals and the intimate structure of bone; Hooke (1635-1703), the primitive fibrillæ of muscle; Kerkring (1640-93), the valvulæ conniventes of the small intestine; Winslow (1669-1760), of Paris, the foramen connecting the two cavities of the peritoneum; Douglas (1675-1742), of London, the recto-uterine pouch and several other features of the peritoneum and the abdominal wall.

The classification of animals by their anatomical structure, attempted first by Aristotle, was revived by several authors during the eighteenth century, and notably by Karl von Linné (Linnæus) of Råshult, in Sweden (1707-78), who considered that each particular species was immutably established at the creation, man being placed at the head in the order Primates. Buffon (1707-88), however, supposed that variations occur from changes of environment, and even hinted that all species may have originated from a primitive common stock. This was afterward more boldly advocated by Lamarck (1744-1829), who was the first to maintain systematically the mutability of species, and to look upon man as derived from a common stock with other organisms, conceiving that the ancestral record of all might be represented as a branching tree. To this was opposed the authority of the great comparative anatomist Cuvier (1769-1832), who caused these views to sink into obscurity for a time.

The controversy concerning the early development of the human body was renewed during this period. The weight of authority was overwhelmingly in favor of the theory of preformation, notwithstanding the absurdities to which it committed its advocates. Its most earnest supporter was Haller (1708-77) (q.v.), professor at Göttingen, a man of remarkable learning and indefatigable research, who did much to further exactitude in anatomical knowledge, and was the leading physiologist of his time. He made many anatomical discoveries in all parts of the body, and finally overthrew the doctrine of "animal spirits," which had ruled all investigations of the nervous system since the days of Hippocrates. He declared, however, that the body of our primitive mother Eve must have contained in miniature all individuals of the human race that had existed since her time and that were hereafter to exist! This was the less excusable, as Kaspar Friedrich Wolff, a young medical student, had published in 1759, as his graduation thesis, a remarkable essay, the *Theoria Generationis*, in which he showed by accurate and conclusive observations that the organs of the body are developed from membranous sheets (the blastodermic membranes), and not from preformed rudiments. He even anticipated the cell-theory of the next century by stating that these membranes are themselves composed of globules (cells). Wolff made many other important investigations, and his name has been perpetuated in that of the Wolffian body or primordial kidney. Such was the opposition with which his views were received that he was unable to obtain a professorship in Germany and went to Russia. It was not until Meckel called attention to his work in 1812 that his merits were fully recognized.

Aristotle, Eustachio, and Fallopio had surmised that the organs of the body might be composed of simpler elements; Boerhaave (1668-1738) supposed that everything could be reduced to vessels and fibres; Haller (1708-77) classified structures according to their properties; Bonn (1738-1818) considered that membranes are the anatomical basis of structure. It remained, however, for Bichat (1771-1802) to establish clearly the doctrine that the body with all its organs is made up of a small number of simple tissues. This he did by an examination of their chemical, physical, and vital properties, dispensing wholly with the use of the microscope, then a very imperfect instrument. He applied these views to the elucidation of the anatomy of organs affected by disease, a subject previously studied by Morgagni (1682-1771) and by John Hunter (1728-93). Bichat's death, at the early age of thirty-one, caused by imprudent exposure in the dissecting-room, was a great loss to anatomical science.

The science of chemistry had now advanced to a point where it could throw much light upon the composition of the animal body. Four great organic gases had been discovered: carbon dioxide (imperfectly known to Van Helmont in 1640) by Black in 1757, hydrogen by Cavendish in 1766, nitrogen by Rutherford in 1772, oxygen by Priestley in 1774. Lavoisier (1743-94) showed the importance of all these gases to the animal economy. Fourcroy (1755-1809) was practically the first to investigate the composition of organic products.

The investigation of the human body by so many competent and careful observers gave a new scope to anatomical teaching. It was seen that no proper knowledge of anatomy or surgery could be obtained without the use of the cadaver. At first, legal enactments and social ostracism were directed against those who practiced dissection; but on the Continent of Europe public dissections were frequently held from the time of Vesalius, and as men of commanding intellect like Malpighi, Stensen, Boerhaave, Morgagni, Haller, Bichat, Hunter, and many others devoted themselves to the pursuit of anatomy, the social stigma was gradually removed. On the Continent, laws were early enacted by which the bodies of prisoners and paupers were turned over for anatomical purposes. In Great Britain, however, this was not done, and bodies were quite commonly obtained by robbing graves. When, in 1827, the University of Edinburgh made dissection compulsory, and this example was followed by the other large schools in the United Kingdom, the demand for cadavers became so great that it was practically impossible to supply it without breaking the law. A set of ruffians known as "resurrectionists" became established in every large city, and no cemetery was safe from their depredations. In Edinburgh two scoundrels named Burke and Hare made a business of enticing poor and friendless persons into their haunts, smothering them, and selling their bodies to the medical schools for dissection. Similar cases were those of Bishop and Williams in London. A remedy for this was found in an anatomy act passed in 1832, which legalized dissection, and authorized the use of available material under certain restrictions.

Improvements in the microscope made about 1824 gave a new impetus to research. Earlier observers (Hooke, 1665; Grew and Malpighi, 1671; Wolff, 1759) had dimly surmised that organic forms were composed of elementary units, but Schwann, in 1839, was the first to demonstrate this for animals in a satisfactory manner. Observations by Von Mohl, Purkinje, Leydig, Kölliker, Virchow, and Max Schultze soon placed this fact beyond cavil, and thus was established the celebrated cell-theory, which declared all organized beings to be composed of essentially similar minute units. This led to great improvements in microscopical technique and the investigation of the chemical properties of cells. Stilling invented section cutting in 1842; Gerlach, carmine staining in 1858; Recklinghausen, silver staining in 1860; Waldeyer, double staining with aniline dyes in 1863, and Golgi, bichromate of silver staining in 1873.

With the establishment of the cell-theory came some remarkable generalizations, which have had a profound effect upon anatomy. According to the views advanced by Herbert Spencer, Milne-Edwards, and others, the human body is to be considered as a cell-community, in which the laws of division of labor and of differentiation that in human society cause specialization into trades, classes, and employments are applied to the morphological units, the cells. Certain cells become specialized for special functions, and thus are produced the diversified forms of the tissues of the body.

Another remarkable result of the improved methods of investigation was, that the body of animals was shown to be developed from a single cell, the ovum. The series of phases by which this astonishing change is effected occupied the attention of many investigators, notably Pander, Von Bär, who established the theory of the germinal layers or blastodermic membranes; Serres, who pointed out the great similarity between the successive phases of the embryo and the series of animal forms now existent on the globe, and a great number of others in all civilized nations. Many details of this wonderful series of changes have yet to be supplied, but the general features of it are now firmly established.

A great impulse was also given to Pathological Anatomy. The phenomena of disease were now traced to the cells, and a knowledge of their anatomical changes was found to be essential. In 1836 Cagniard de la Tour discovered the yeast plant, and many fanciful theories of fermentation and disease were overthrown. Pasteur (1822-1895) demonstrated that all fermentations and putrefactions are caused by minute spores that swarm in ordinary air. The parasitic character of many disorders now became evident, and the foundation was laid for modern aseptic surgery. See HISTOLOGY and PATHOLOGY.

It was not until 1859 that the knowledge hitherto obtained was fully applied to the elucidation of the causes of bodily structure. In that year Charles Darwin published the *Origin of Species*, and followed it in 1871 with *The Descent of Man*. These works advanced beyond the position of Lamarck, in that they showed an efficient cause for the cumulative variation of structure among organisms. This is the "struggle for existence" which results in the extinction of those forms not suited to the environment. Unlike the speculations of many previous writers, these views were advanced with extreme caution and supported by a great number of careful observations. They were accepted by a large body of naturalists, and caused a renewal of activity in anatomy and the allied sciences. It became evident that to fully understand the structure of man it was necessary to ascertain the laws of development both in the embryo and in the animals from which the human stock may be derived. Comparative Anatomy, Embryology, and Paleontology thus became powerful coadjutors to Human Anatomy.

The importance of the study of the varieties of man now became recognized. Previous workers in this field were Camper (1722-89), the inventor of the facial angle; Blumenbach (1752-1840), who divided mankind into five races; and Retzius (1796-1860), the inventor of the cephalic index for comparing crania. In America Samuel G. Morton became widely known by his great collection of crania, now in the Academy of Natural Sciences in Philadelphia. His *Crania Americana* and *Crania Ægyptiaca* were important contributions. His collections were, in 1856, described and commented on by another anatomist, J. Aitken Meigs, who did much to establish the modern methods of the mensuration of the skull. No account of this period is complete without a reference to the work of Jeffries Wyman, of Harvard University, who was a man of great erudition and philosophical insight. As a morphologist he had no superior among the anatomists of his day. He was the first to describe the arrangement of the bony spiculæ in the neck of the human femur, and to contrast it with that in those animals that do not assume the erect posture. He gave the first scientific description of the anatomy of the gorilla, and wrote on symmetry and homology in the limbs, on the vertebral theory of the skull, on teratological subjects, on spontaneous generation, and on the anatomy of the Hottentot. The question of the unity or diversity of origin of the human race, which was closely connected with the origin of species, excited considerable attention in America about the middle of the nineteenth century. J. C. Nott and George R. Gliddon were the joint authors of two important works on this subject, entitled *Types of Mankind* and *Indigenous Races of the Earth.* This study was greatly stimulated by the discovery of human remains in strata belonging to previous geologic epochs, particularly at Engis and Spy in Belgium, Neanderthal near Düsseldorf, at many places in France, and in South America. Finally the prediction of Morton, made forty years before, was verified by Dubois, who found, in the Eocene strata of Java, fossil remains of a remarkable transition form between apes and man (1890-95). This department of anatomy was greatly advanced by the zeal and energy of Paul Broca (1824-80) of Paris, who systematized the methods in vogue, and invented many new ones for the examination of the human body.

The localization of all active properties in the cells gave renewed impetus to the study of the structure of these "elementary organisms." At first this structure was believed to be comparatively simple, the protoplasm of which the living substance is composed being apparently a structureless jelly having peculiar physical and chemical properties. Further advances toward perfecting the microscope and microscopic technique have shown this to be a mistake. That protoplasm has definite structure is now agreed by all; the details of the structure are still in dispute. Eminent in this investigation were Carl Heitzmann of New York, Flemming of Kiel, and Bütschli of Heidelberg. The phenomena of indirect cell-division (*karyokinesis*) were first connectedly observed by Schneider in 1873, and have been especially investigated by Van Beneden, Boveri, Oscar Hertwig, and Rabl. The ultimate constitution of the cell received a great deal of attention. Nägeli, in 1884, framed an hypothesis that protoplasm is composed of certain elementary units, termed *micellæ,* whose combination produces its physical and vital properties much as a combination of molecules produces the physical properties of inorganic bodies. Similar, more widely developed theories were framed by De Vries, Hertwig, Weismann, and others. Weismann attempts to explain the phenomena of heredity by supposing that bodily characters are caused by architectural peculiarities inherent in the original generative cells. This is, therefore, a reappearance of the theory of preformation so prevalent during the eighteenth century. Experiments by Hertwig appear to have disproved Weismann's views. Great activity in the investigation of the structure of cells still continues. In America, Wilson of New York and Whitman of Chicago have made important contributions to our knowledge of this subject. Heitzmann, of New York, is well known for his attack upon the cell-theory as commonly taught, holding that the cells of the body are connected by minute threads of protoplasm; a theory that has recently been confirmed to a limited degree.

The great strides made in our general knowledge of structure during the nineteenth century can only be briefly mentioned. The structure and development of bone was elucidated by Goodsir, Purkinje, Sharpey, and Kölliker, the osteoblasts being discovered by Gegenbaur in 1864. The mechanism and development of joints were studied by Braune of Leipzig, Sutton of London, Dwight of Boston, and Bernays of St. Louis. The minute anatomy of muscle is still under consideration, and has been investigated by Krause, Ranvier, Cohnheim, and many others; Humphrey and Huxley (q.v.) in England and Gegenbaur in Germany have written on the general morphology of the muscular system, and Gruber, Theile, Testut, and Ledouble have investigated muscular anomalies. The structure of the capillary blood vessels was first correctly demonstrated by Treviranus in 1836. The blood platelets or hematoblasts were discovered by Max Schultze in 1865. The lymphatics were investigated by Kölliker, Ranvier, and Sappey.

In the nervous system the discoveries have been many and brilliant, completely revolutionizing previous notions of its structure. Gratiolet first showed the convolutionary pattern of the brain; Broca was the first to prove that certain motor faculties may be localized upon the cerebral cortex; a subject upon which extensive researches have been made by Fritsch and Hitzig, Ferrier and Horsley. Ehrenberg of Berlin appears to have been the first to describe, in 1833, the large cells of the cerebral cortex and of the spinal cord. The axis cylinder process of nerve cells was discovered by Wagner of Göttingen, Marshall Hall (q.v.) of London was the first to demonstrate reflex movements, Prochaska to discover the differential function of the anterior and the posterior roots of the spinal nerves. By degeneration experiments instituted by Waller, by noting the myelination of nerve fibres as done by Flechsig, and by comparative studies it became possible to trace in the central nervous system the paths by which sensations are received and motor influences discharged.

Improvements in technical methods finally made it possible to trace the processes of nerve cells to their minutest ramifications. This gave rise to the neurone theory, which holds that the nervous tissue is composed of independent cells or neurones that may ramify extensively, some of the ramifications passing into nerve fibres and forming their active conducting elements. This theory has been applied with success to explain the architecture of the nervous system; a subject that is widely engrossing the minds of anatomists, and from which important results are expected in the future.

In the organs of special sense the new ideas of the constitution of the nervous system have elucidated many difficult problems. The anatomy of the ear has been studied by Rüdinger, Helmholtz (q.v.) of Berlin, Retzius of Copenhagen, and Ayers of Cincinnati. The organ of Corti was discovered by the Marchese di Corti in 1851. Schwalbe of Strassburg first saw the taste-buds of the tongue in 1867, Meissner and Wagner the tactile corpuscles in 1852. The teeth have been a special object of research with the American anatomists Ryder, Osborn, and Cope, especially with reference to the mechanics of their development.

The researches of American anatomists have borne fruit in other fields. W. E. Horner of Philadelphia discovered the tensor tarsi or deep layer of the orbicularis palpebrarum, and William Clay Wallace of New York was the first to show the real nature of the ciliary muscle (1835). It is to Henry J. Bigelow, of Harvard University, that we owe the first accurate description of the ilio-femoral ligament of the hip-joint and its application to the reduction of dislocations. His work on the hip, published in 1869, completely revolutionized surgical practice in this matter. It should not be forgotten, however, that Reid, of Rochester, N. Y., had previously, in 1851, shown many of the facts afterward more completely stated by Bigelow. In the realm of comparative anatomy, and especially of paleontology, Joseph Leidy, O. C. Marsh, Harrison Allen, and Edward D. Cope have done much to extend the fame of American science.

BIBLIOGRAPHY. Among the recent works on human descriptive anatomy may be mentioned: Quain, Gray, and Morris, in English; Testut and Poirier, in French; Gegenbaur and Rauber, in German. Bardeleben is editing a large work in German, in eight volumes, by various authors. On topographical anatomy, McClellan and Treves, in English; Tillaux, in French, and Hyrtl, Gerlach, and Merkel, in German, are good works. There is no satisfactory treatise on the history of anatomy. A fairly complete résumé is found in Volume I. of *The Reference Handbook of Medical Sciences* (second edition, New York, 1900).

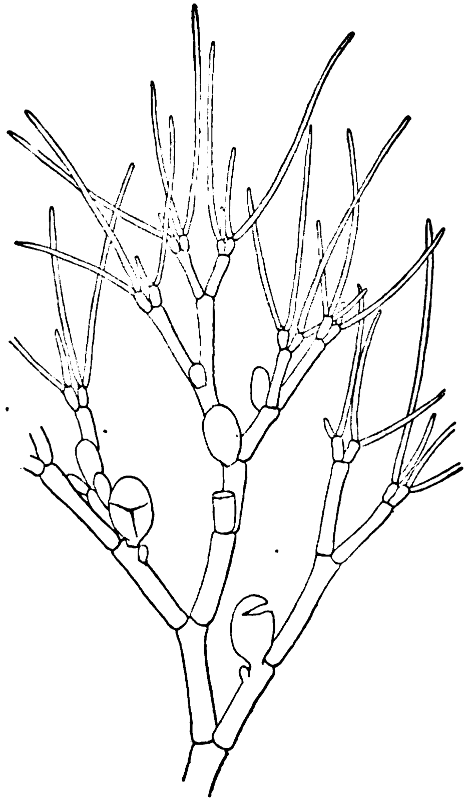
ANATOMY, COMPARATIVE. The science that treats of the structure of organisms with the aim of discovering their evolutionary history and of determining what parts are fundamental and primary and what have undergone modifications due to functional changes. This, at least, has been the aim of comparative anatomy since the doctrine of evolution has guided anatomical research. In the early half of the nineteenth century the aim of comparative anatomy was to assist taxonomy, or the natural classification of organisms, by giving a basis for separating the more essential parts (to be used as the basis of the larger groups) from the less essential parts (the basis of the smaller groups). In the latter half of the nineteenth century the aims of comparative anatomy were fostered by the newer science of comparative embryology, which added a new source of evidence for tracing evolutionary history. Together these sciences constitute comparative morphology. In this work the facts which might have been brought together into a general article under this title are distributed under more special headings. Thus, for the history and general scope of comparative anatomy, see ANATOMY; for the comparative anatomy of the several parts of the body, see respectively SKELETON; ALIMENTARY SYSTEM; MUSCULAR SYSTEM; NERVOUS SYSTEM; CIRCULATORY SYSTEM; RESPIRATORY SYSTEM; REPRODUCTIVE SYSTEM; EXCRETORY SYSTEM, and similar titles in connection with human anatomy and physiology, and in zoölogy and embryology. Consult: Cuvier, *Leçons d'anatomie comparée* (first edition, 5 volumes, Paris, 1800-05; second edition, 8 volumes, 1836-44); Meckel, *System der vergleichenden Anatomie* (Halle, 1821-29); Owen, *Comparative Anatomy of Vertebrate Animals* (fourth edition, London, 1871); Huxley, *Anatomy of Invertebrates* (London, 1877); id., *Anatomy of Vertebrate Animals* (London, 1871); Gegenbaur, *Elements of Comparative Anatomy* (translation, London, 1878); Wiedersheim, *Comparative Anatomy of Vertebrates* (translation, London, 1898); id., *Lehrbuch der vergleichenden Anatomie* (Jena, 1866); Lang, A., *Textbook of Comparative Anatomy* (of Invertebrates) (translation, London, 1891-96).

ANATOMY OF ABUS'ES, THE. A work by the Puritan Philip Stubbes, published in 1583, condemning many of the customary amusements of the time. A reply to it, by Nashe, was entitled *Anatomie of Absurditie* (1589).

ANATOMY OF MEL'ANCHOLY, THE. A celebrated and curious work by Robert Burton (1577-1640), first published in 1621 and many times thereafter. It treats, as its full title explains, of "all the Kindes, Causes, Symptomes, Prognostickes, and Severall Cures" of melancholy. It appeared under the pseudonym of Democritus Junior, a name which indicates its author's attitude. There is an extended preface, not the less interesting for being autobiographical. The body of the book is in three methodically arranged parts, dealing successively with (1) the causes and symptoms of melancholy; (2) its cure; (3) amorous and religious melancholy. Throughout there is a wealth of historical and literary lore and a quaint and penetrating humor, which have made the book a favorite with many of the finest minds. Dr. Johnson and Charles Lamb especially have recorded their admiration of it. The five editions succeeding the first one included changes of text by Burton himself. Since his time it has been variously abridged.

ANATOMY OF PLANTS. That part of botany which treats of the structure of plants. Gross anatomy relates only to those parts, external or internal, which can be observed with the unaided eye. Minute or microscopical anatomy, treating of the tissues, the cells of which they are composed, and their relation to one another, is technically called histology (q.v.). For purposes of description, the plant body is divided into parts, called "members" or "organs," according as one wishes to emphasize the idea that they constitute portions of the body, or that they do something. Members or organs are of various ranks with respect to the body or to each other. Thus, one may speak of the root and the shoot as members of the plant; axis and leaves are members of the shoot, and so on, each part being resolvable into subordinate parts. Analysis ceases only with the component cells, each of which has definite organs, such as nucleus, chloroplasts, etc. See CELL (in plants).

External Anatomy. The formation of external organs depends on the unequal growth of the cells composing the body, or of definite groups of them. Thus arise lobes or segments having their own special forms. In the simplest algæ and fungi the external segmentation of the body is slight or wanting. The entire body may be represented by a single spherical or oblong cell. Sometimes these cells are branched. In certain desmids the branching is elaborate, and so symmetrical as to make the body an object of great beauty. In all these cases, however, the branch has, in itself, a structure precisely like the main body. In somewhat more complex plants the body consists of a row or filament of cells. Among these plants it is very common to find branches arising which are themselves branched, and repeat in all essential characters the main axis. Other plants have their cells arranged in the form of a flat plate. This plate may become more extended in one direction, producing a band-like form. If branching occurs, it is likely to take place in the plane of the flattening. The branch may be essentially like the main axis, or it may take on a special form. Sometimes the more extended growth occurs in several directions, when the body becomes more or less regularly lobed. Unequal growth of any part of the flat body will produce a fluted or frilled form.

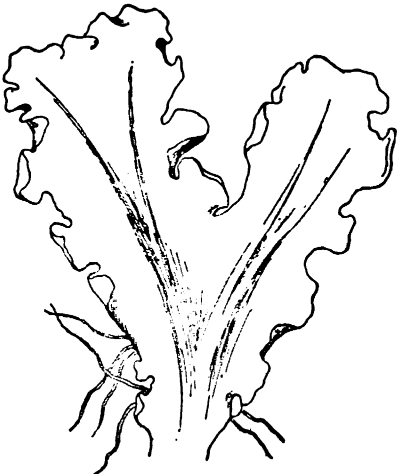


An alga, showing nearly undifferentiated body; terminal and sexual cells only unlike the rest.

It is only when the plants become massive, so that some cells are exposed on the surface and others hidden in the interior, that marked dissimilarity arises. Then the external parts are likely to be differentiated from the internal, because of the unlike conditions under which the two exist. However little or much the body may be lobed, there will be an unequal exposure to light, and the side best illuminated, whether of organ or whole plant, will take on a different structure from the shaded one. Thus the whole body of liverworts and the leaves of seed plants become dorsiventral. Other factors also determine the mode of growth; e.g., an erect position and the consequent exposure of the body to the loss of water demands organs for absorption, for conduction, and for protection against excessive evaporation; again, the cells in the interior, removed from the air, must be supplied with it by the development of an aërating system.

Thallophytes. The vegetative body of the lower plants is the gametophyte, i.e., the phase in the life history which produces sex organs. (See Alternation of Generations.) The external anatomy of the gametophyte is therefore first considered. Among the algæ and fungi there is little differentiation of the body, because it is usually slender, and all parts are equally fitted to carry on independently the life work. Among the highest algæ, the lower part of the body is often so constructed as to form (a) hold-fasts, by which the plant is anchored to the surface on which it grows; (b) a roundish stalk of greater or less length; and (c) thinner flattened parts, which expose a large surface to the water and light, and so imitate leaves. (See Algæ.) Among the higher fungi the body is segmented into a nutritive portion, the mycelium, which usually ramifies extensively through the substratum, and a reproductive part, which rises into the air and produces spores. The aërial part of the body may be club-shaped, umbrella-like, diffusely branched, spherical, etc. See Fungi.

Bryophytes. Among the liverworts the body is either a flat ribbon, more or less branched, or is segmented into a roundish axis with thin, scale-like outgrowths on upper and under surfaces, the upper ones being relatively large, conspicuous, and green. whence they are called leaves; while the under ones are small, inconspicuous, and pale. From various parts of the body on the under side arise hold-fasts in the form of slender hairs (rhizoids). Similar out-



A thallus of a liverwort, Blasia, showing a simple ribbon-like body, with lobed edge.

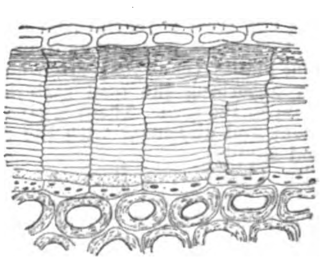
growths, but of varied form, are not infrequently found on other parts of the body. (See Hepaticæ.) In mosses, the body, when young, is a much-branched filament, usually transient, from which there arises a more permanent cylindrical axis, erect, with few branches, or horizontal and much branched, on whose sides are developed green thin outgrowths, the leaves. These are usually a single sheet of cells, except near the middle line, where several layers of cells constitute a midrib. The shapes of the leaves are extremely varied. See Musci.

Pteridophytes and Spermatophytes. The gametophyte of the ferns is a thin, roundish, heart-shaped body, seldom exceeding a quarter of an inch in diameter, and transient. In fern allies it is reduced to a few cells, and is not visible without microscopic observation. The vegetative body, which is long lived, does not bear sex organs as in the lower plants, but gives rise only to non-sexual reproductive bodies of various kinds called spores; whence it is known as the sporophyte. (See Alternation of Generations.) The external anatomy of the sporophyte in the pteridophytes (ferns and their allies) and spermatophytes (seed plants or flowering plants) is much alike. It is almost without exception segmented into two distinct parts, the root and the shoot. The root is usually much branched, and bears on its newer parts surface outgrowths called root-hairs. The tips of the branches, at which the growing points are located, are protected by somewhat older cells, which constitute a root-cap. (See Root.) The shoot is usually differentiated into a central axis, the stem, with lateral outgrowths of two kinds: (1) Those having unlimited growth; i.e., branches, which are similar in all essential respects to the main axis, though they may be specialized in form and function. (For further details respecting the structure of the stem and the forms which it assumes, see Stem.) (2) Segments with limited growth, usually flat, thin, and broad; i.e., leaves, which are developed in a variety of forms. (See Leaf.) Simple outgrowths of various forms, arising from single cells or small groups of cells, may develop on any part of the shoot as scales, hairs, etc.

Internal Anatomy. The internal anatomy of plants can only be ascertained by the study of thin sections, crossing the body in various planes, and by dissection of the parts. In the lower plants the internal anatomy is as simple as the external form, no differentiation of the cells being observable. In the higher plants, however, groups of cells are differentiated into tissues, and the tissues are arranged into systems, each of which has a particular function to fulfill. These tissue systems are named according to their function. The most important are the following: (1) The protective system; (2) the absorptive system; (3) the conducting system; (4) the nutritive system; (5) the aërating system; (6) the secreting system; (7) the storage system; (8) the mechanical system.

The tissues and tissue systems all arise in an unspecialized formative tissue. Every plant begins its development as a single cell. Repeated divisions of this cell and its segments give rise to others essentially similar. For a time these cells retain the same general form and powers, noteworthy among which is the capacity of division. As the cells become older they grow unlike, and change not only in form but in function. Some maintain throughout their entire existence the form and appearance of the youngest cells. These constitute a formative region (meristem), which, by its growth, gives rise constantly to new tissues and new organs. This primary formative tissue is found in the larger plants at the extremities of the main axis and branches of the roots and shoots, where it constitutes the growing points. It is possible, however, for cells which have ceased to divide to regain this power and to resume the character of formative tissue. To distinguish this latter from the primary meristem of the growing points, it is called secondary meristem, or cambium. Secondary meristem is often formed in one or more concentric zones in the stems of those plants which increase in thickness as they become older, in the vicinity of wounds, and at various points which cannot always be predicted. At these points its activity results in the making of new tissues, or even new organs, in a maner essentially like that in the growing points. A short distance behind each growing point the cylinder of newly formed tissues differentiates enough to show three regions: (1) The outer cell layer, the "dermatogen," which gives rise to the epidermis, and all its structures; (2) the central mass, the "plerome," which develops the central cylinder or stele, including the vascular strands and pith; (3) between these, the "periblem," which produces the cortex. The distinction between these regions is permanent, becoming more marked with age.

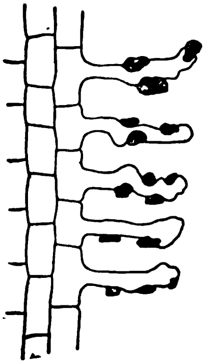
(1) The Protective System. In algæ and fungi, which live in water or moist places, the need for protection is seldom of moment. The transformation of the surface walls into a gelatinous material is common among even the simplest algæ, and may be looked upon as a protective measure. Some of the larger algæ have the cells near the surface of the body smaller and more compact than those of the interior. In the aërial parts of some fungi a compact arrangement or coalescence of the filaments, and sometimes the thickening of their walls, makes the surface firm or even hard. In the larger plants, however, the surface tissues are usually organized into a continuous membrane, the epidermis, in places perforated by numerous but minute openings, the stomata, which are bounded by special cells, and guard cells. (See Stomata.) The epidermis sometimes becomes more than one layer of cells in thickness. This is regularly the case at the tip of the root, where it forms a thimble-shaped cap. The outer wall of the epidermal cells is frequently much thickened, and is usually partially occupied by a wax-like substance,



Cork cells (*periderm*) developed under the epidermis (the outer layer of cells) by divisions parallel to the surface in the cork cambium (*phellogen*), next the rounded cells of the cortex.

cutin, which renders the wall partially waterproof. The extreme outer portion of the wall may be completely transformed into cutin, constituting the cuticle. Besides this, the epidermal cells, when young and active, are capable of excreting upon the surface a layer of waxy or resinous material, which interferes still more with the exit or entrance of water. Outgrowths from the epidermal cells in the form of hairs or scales, with which the surface is sometimes completely covered, also retard evaporation. On the twigs of perennial plants the epidermis dies and withers away. Its place is then taken by several or many layers of dead cells of a tabular form with waterproof walls, called cork. This is the product of a zone of secondary meristem developed under, or, more rarely, in the epidermis itself. Cork gives to the stems or twigs of trees their yellowish or brownish color. On older parts it forms the outer parts of the bark (q.v.).

(2) The Absorptive System. (See Absorption.) The absorptive system of the fungi consists mainly of the Mycelium (q.v.). The Algæ (q.v.) may take up materials by any part of the surface exposed to the water. In mosses and liverworts the hair-like outgrowths by which they are anchored (rhizoids) are supposed to be absorptive, but sufficient proof of this is lacking. The leaves or even the general surface of the body are the most efficient absorbing regions. In the higher plants the absorptive system for water and its solutes is represented mainly by the root, and especially by the root-hairs. For gases, the absorptive system is the whole surface of the aërial parts, but notably that of the leaves. In a few plants there are special outgrowths on aërial parts in the form of hairs, which are able to absorb water, or even solutions of organic material; but as a rule the amount of water which may be absorbed by the aërial part of a plant is so small as to be negligible. Very young plants (embryos) often have special organs for absorbing the food materials stored around them in the seed. These organs, however, are transient and disappear with the exhaustion of the food supply.


Root-hairs (not yet full-grown) on the root of wheat seedling. The protoplasm of cells is not shown. The hairs adhered so firmly to certain soil particles that they could not be washed off.

(3) The Conducting System. Water and foods may be transferred from one part of the body to the other through any of its living tissues by differences in osmotic pressure. (See Osmosis.) In the smaller plants, these osmotic movements probably suffice, but in the large forms they are too slow, and special conducting systems have therefore been developed. These consist of strands of elongated cells extending from the neighborhood of the absorbing or food-making regions throughout the body and reaching all its parts. The conducting system is often called the fibro-vascular system, because its essential elements were formerly called "vessels" (after the analogy of blood "vessels"), and these are frequently accompanied by mechanical elements in the form of fibres. The conduction (q.v.) of water and foods is carried on in the main by separate strands. The water-conducting strands are the xylem strands, the food-conducting ones the phloem strands.

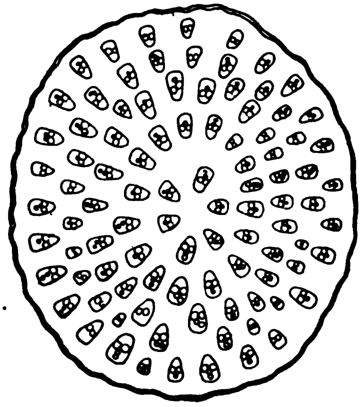
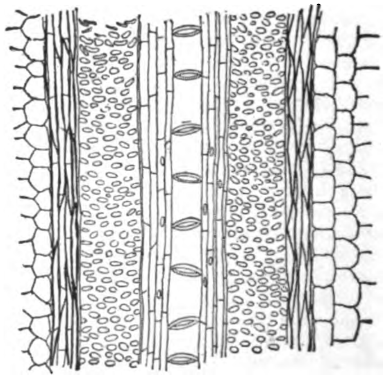
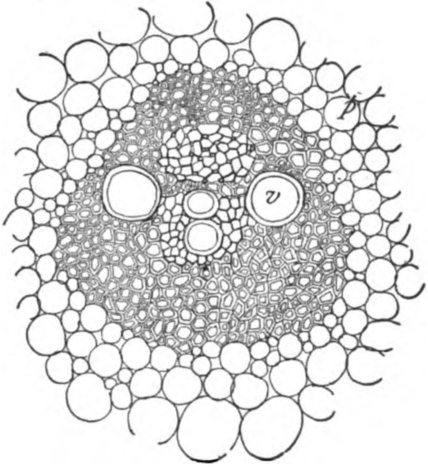


Diagram of the transverse section of a monocotyledonous stem (*Asparagus*). The ovate bodies scattered through the section indicate the sheathed pairs of xylem and phloem bundles.

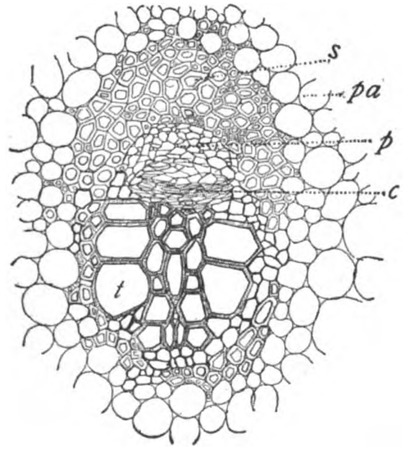

Diagrammatic longitudinal tangential section of a xylem bundle of Corn (*Zea mays*), showing the surrounding parenchyma (thin, isodiametric cells); the sheath (thick-walled, elongated, pointed cells); two pitted vessels (tracheæ); and in the centre an annular vessel.

The xylem strands consist of tracheæ, or tracheids, accompanied by variable amounts of parenchyma cells and often fibres. The tracheæ are formed by the fusion of rows of elongated cells through the absorption of most of the abutting end walls. They thus become long tubes (1 to 3 meters), emptied of protoplasm at maturity, and with their walls irregularly thickened, often in elaborate patterns. The tracheids are similar, but do not suffer the absorption of the end walls, so that each is a cell and not a cell-fusion. The phloem strands consist essentially of sieve tubes and varying amounts of elongated parenchyma-cells. The sieve tubes resemble the tracheæ in the loss of living contents, but differ from them in the more uniform thickness of their walls, and particularly in having only portions of the end walls (or even the side walls between adjacent sieve tubes) absorbed, so that they are perforated by many minute openings.



Transverse section of a sheathed bundle-pair from Corn (*Zea mays*). *p*, parenchyma cells; within these the sclerenchyma sheath; *v*, a pitted vessel with its fellow opposite, and two annular vessels between, with the adjacent tissues mark the xylem bundle; the area above and between the pitted vessels is the phloem bundle.

The xylem- and phloem-strands have a definite relation to one another in position. In the pteridophytes, the phloem-region often envelops the xylem region completely, though in a few cases it is enveloped by the xylem. In most of the spermatophytes, however, these strands lie side by side, the xylem as a rule nearest the centre and the phloem nearest the periphery of the axis. They extend into the leaves, in which they occupy the so-called ribs or veins, the xylem nearest the upper side, the phloem nearest the under side. Together they form the smaller veinlets, becoming slenderer and having fewer elements with successive branching, until the phloem-strand disappears, leaving the xylem-strand to form the finest veinlets, invisible to the naked eye, which end blindly amongst the green cells, or form a network with other small strands. Near its ending in the leaf the xylem-strand is composed exclusively of tracheids. The xylem- and phloem-strands originate near the growing points by the differentiation of the tissues which arise from the plerome. Taken all together, they constitute a central cylinder in the root and stem, known as the stele. In some stems, especially among the pteridophytes, there are several independent steles, but more often this appearance is produced by the branching of the stele, as in the stalks of leaves. In the stems of many plants, especially dicotyledons, a formative region, the stelar cambium, arises in the stele between the xylem- and phloem-strands. This may give rise to additional xylem- and phloem-tissue, and so increase the size of these strands. More often, however, it extends from one pair of strands to another, and so constitutes a complete zone, by means of which not only is the thickness of the original strands increased, but that of the intervening tissues as well. Usually new xylem- and phloem-strands are produced by the stelar cambium between the older ones. Thus it may come about that the stele shows a massive development of secondary xylem in the centre and secondary phloem around it, the two separated by a thin sheet of cambium. This is the condition in all deciduous and coniferous trees. The centre of the trunk is composed of old and dead xylem-tissue, its outside of bark, most of which is likewise dead, the only living parts being the cambium and adjacent tissues.



Cross-section of a single bundle pair. *pa*, inclosing parenchyma; *p*, phloem bundle; *t*, xylem bundle; *c*, cambium; *s*, accompanying sclerenchyma, sometimes called bast fibres.

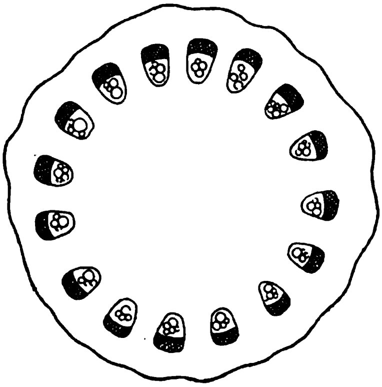
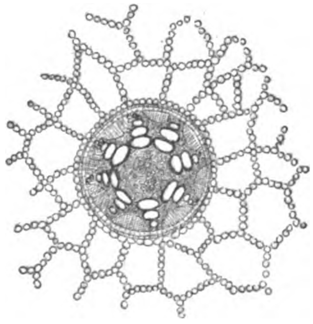


Diagram of a cross section of dicotyledonous stem, showing a single circle of bundle pairs (the cross-hatched region—phloem bundle, the rest—xylem bundle) dividing the outer region (cortex) from the central (pith).

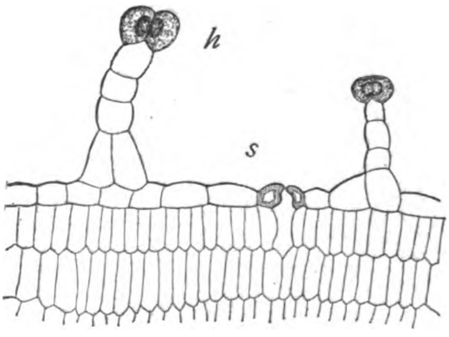
(4) The Nutritive System. The nutritive system consists of cells, usually thin-walled, among whose organs are found one or more chloroplasts (q.v.). The massing of these cells gives the green color to the nutritive regions. If the plant body be more than a few cells in thickness the nutritive tissues are limited to the surface, because the green coloring matter, chlorophyll (q.v.), can be produced and maintained only under adequate illumination. The interior tissues, therefore, are colorless, because of the absorption of light by the outer ones. The nutritive tissues may occupy the surface of the stem only, but their most effective disposition is in the leaves. In some liverworts and in the mosses, the so-called leaf consists of a single layer of cells; they are not like the leaves of the higher plants either in mode of origin or in structure, although they serve the same function. (For structure of the leaf of the higher plants,

see Leaf.) The manufacture of food can only take place in cells containing chloroplasts, when these are adequately illuminated. (See Photosynthesis.) The food produced by the nutritive tissue is primarily carbohydrates. This may be used at once for the formation of proteid foods, and since the supply of carbohydrates is most abundant in the leaves, they are also the principal seat of proteid formation. (See Food of Plants.) Foods produced in the leaves may be transported to other parts of the plant and stored for a time. (See Storage.) In those plants which lack foliage leaves the surface of the stem only is occupied by the nutritive tissue, and by its profuse branching it may expose a considerable area of these tissues to light and air. In some cases, however, the necessity for protecting the plant against excessive evaporation is so urgent that the body has no outgrowths, being cylindrical or spherical, as in the cactaceæ; in such a case the nutritive tissue is limited to the surface of the compact stem, and is at a minimum.

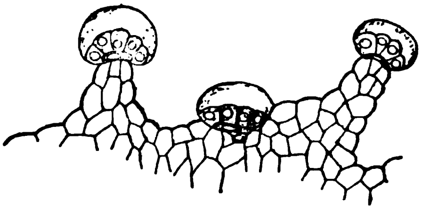
(5) The Aërating System. The aërating system consists of irregular passages amongst the cells of the plant body, formed by the separation of the cells as they mature. These passages communicate with the outside air by special opening through the epidermis, called stomata (q.v.). If the epidermis dies and is replaced by cork, as on the surface of twigs, communication of the aërating system with the air is maintained for a few years through lenticels (q.v.). The intercellular spaces are largest in the water plants, where they often form extensive canals easily visible to the naked eye. In most land plants, however, they are narrow, tortuous passages. Through these gases diffuse, but there is little or no flow, i.e., mass movement. Carbon dioxide and oxygen are supplied to the cells in requisite amount by the aërating system, the former for food-making and the latter for respiration. See Aëration.

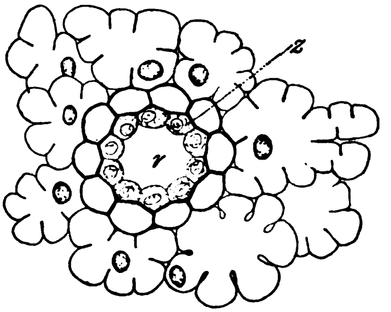

Transverse section of the central part of the root of Calamus (*Acorus calamus*), showing the central cylinder of xylem and phloem bundles and huge air-chambers, separated by plates of cells.

(6) The Secreting System. There is no sharp distinction to be made between secretion and excretion in plants. Many substances, useless to the plant except incidentally, are stored in special receptacles, and are thus removed from the general course of activity. In other cases the material is poured out upon the surface of the plant and is thus gotten rid of. The secreting system consists of (1) single secreting cells or groups of them, called glands (q.v.); (2) receptacles for secretions. Gland-cells differ in appearance from the other cells by the very granular character of their protoplasm. Single glandular cells are common both in the interior of various organs and at the surface. On the surface they are not infrequently raised upon a longer or shorter stalk, in which case they constitute glandular hairs.



Hairs from leaf of Centaurea, terminating in glands *h*. At *s*, a stoma


Emergences of the Hemp (*Cannabis sativa*), capped by glands, showing the cuticle lifted into a vesicle by the secretion.

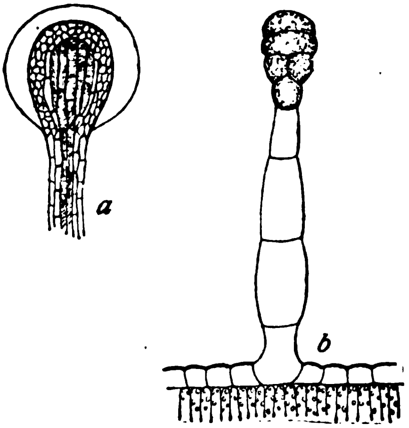


A cross section of a resin duct in a young pine leaf. *r*, receptacle for the resin, formed by the separation of the secreting cells, *z*. Later the cells surrounding *z* become thick-walled and prevent collapse of the duct.

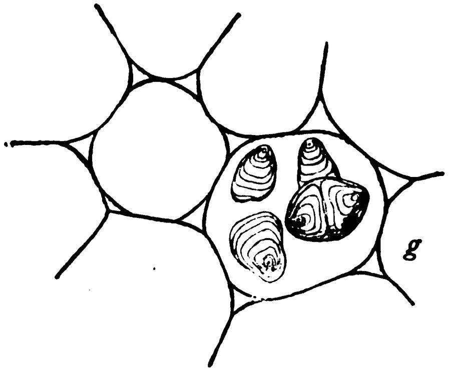
Receptacles for secretions are produced either by the unusual enlargement of an intercellular space among the gland-cells, or by the degeneration of the gland itself, leaving the secretion lying amongst the tissues originally enveloping the gland.

(7) The Storage System. The storage system consists of masses of thin-walled cells, which are usually extraordinarily developed in certain organs. Any organ, root, stem, leaf, or even a flower-bud, may thus be specially adapted to storage. The storage-cells retain their vitality, and have the power of organizing the food materials coming to them into permanent storage

forms. The reserve foods consist chiefly of starch, inulin, cellulose, sugars, oils, and proteid materials of divers kinds. The proteids are stored in the form of granules. (See ALEURONE.) Starch is also stored in granular form, each grain being organized as a sphere-crystal by a leucoplast (q.v.). Sugars are accumulated in solution in the cell-sap, which may contain 5 to 20 per cent. Oils are stored usually in liquid form, as droplets in the protoplasm.



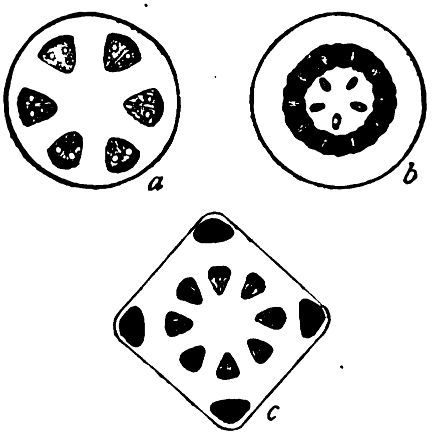
a, a glandular lobe of the leaf of Drosera, with the clear secretion *in situ*. In the centre of lobe a water-conducting bundle.
b, a glandular hair from the leaf of tobacco. The secreting cells are shaded.



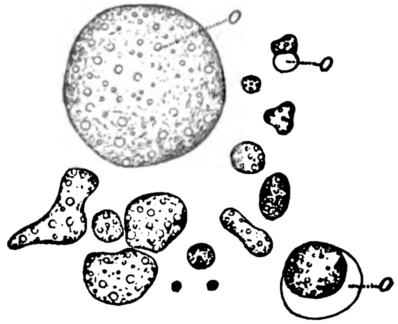
A bit of the section of a potato tuber, showing parenchyma cells, with starch grains in place.

In a few cases tissues are devoted to water storage. Water-storing tissues are found in plants which inhabit regions where they must provide against excessive water loss. The leaves of Begonia and the stems of Cactaceæ furnish illustrations.

(8) THE MECHANICAL SYSTEM. The mechanical system consists of cells called stereids, sometimes short, sometimes elongated, whose walls have become much thickened. The living contents of mechanical cells usually disappear when the walls become excessively thick. Short (isodiametric) stereids, developed in mass, afford resistance to crushing, as in fruits and seeds. Elongated stereids are called fibres. They impart elasticity, extensibility, flexibility, and tensile strength to the body. All these qualities depend solely upon the cell walls and the mode of union of the elements. The mechanical tissues are disposed in the plant body in such a way as to be highly efficient, conforming in their distribution to the best modes of mechanical construction for imparting rigidity and strength. In cylindrical organs like the stem they are placed near the periphery, on the principle of the hollow column, or the built-up column of latticed girders. In bilateral organs, like leaves, where tearing is possible from wind strains, the mechanical tissues are so developed as to afford protection to the edge against tearing, and in the ribs they are so placed as to maintain the softer tissues in the expanded position.



Diagrams of cross-sections of stems to show the distribution of mechanical tissues (black). *a*, shows the I-beam principle; *b*, the hollow column; *c*, the built-up girder.



Elaioplasts from a plant with the milky sap, showing *o*, oil droplets, which sometimes accumulate at one side of the elaioplast.

The development of mechanical tissues depends, in large measure, upon the influence of external agents, particularly stresses acting in various directions. Thus it comes about that the different organs attain the strength necessary to maintain their position, or to hold the attached parts as they increase in size and weight.

For a description of the different kinds of tissues involved in the foregoing systems, see HISTOLOGY.

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AN'AXAG'ORAS (Gk. Ἀναξαγόρας) (c. 500-428 B.C.). The last great philosopher of the Ionian School. He was born between 500 and 496 B.C. at Clazomenæ, in Ionia, the son of Hegesibulus. His family was wealthy and distinguished, so that the young Anaxagoras was able to devote himself to intellectual pursuits. Soon after the Persian Wars he moved to Athens, where he lived and taught many years, thus transplanting philosophy from Ionia to Attica, which was destined to be its home for many centuries. Among his pupils were some of the most distinguished Athenians, Pericles, Euripides, possibly Socrates and Archelaus. But after about thirty years' residence he was charged with impiety toward the gods, apparently by the opponents of Pericles, who took advantage of Anaxagoras's novel explanations of natural phenomena to injure the statesman through his friend. The eloquence of Pericles, however, secured a reduction of the sentence from death to banishment for life, and Anaxagoras, after some wanderings, settled at Lampsacus, on the Hellespont, where he died in 428 B.C.

The teachings of Anaxagoras cannot be exactly determined in all points. Of his work *On Nature*, in which he set forth his system, we have only fragments. But it is clear that he made a distinct advance over the earlier Ionian philosophers in that he defined a new principle, *intelligence* or *mind* (νοῦς), as operating on *matter*, thus introducing a dualistic explanation of the universe in contrast to the materialistic monism of his predecessors. This dualism was further developed by Plato and Aristotle. The varied processes of change, growth, and decay were apparently explained to be the combining and separating of matter under the directing influence of intelligence. It was taught that matter is single in its nature, and consists of an infinite number of invisible atoms inconceivably small (σπέρματα, "seeds," named ὁμοιομερῆ by Aristotle); these in their original condition make the unformed primitive material, possessing no characteristics. When acted on by intelligence, they form individual objects we see about us; i.e., bars of gold, or iron, or copper are made up of the same material, but in each case intelligence has caused a result different from the others; and further, the processes of change produced by the spiritual principle are what we call natural phenomena. Intelligence acts from a point, the pole, setting the "seeds of matter" into spherical motion. By this movement the lighter parts are separated from the heavier, the former to be the clear, glowing upper air (ether), the latter to gather in the centre, and, by cooling, to become water, land, stones, and minerals. The heavenly bodies are masses of stone cast from the revolving earth into the fiery ether, where they are heated and continue their courses, the sun being a mass larger than the Peloponnesus. Anaxagoras's notions with regard to the moon's light, the cause of the rainbow, of winds, and of sound were fairly accurate. Plants, the lower animals, and man owe their existence and continued life to the Supreme Intelligence which resides in them. In his doctrine of atoms, his "seeds," Anaxagoras approaches the teaching of the Atomic School. (See DEMOCRITUS.) Naturally Anaxagoras did not conceive the nature of his spiritual principle clearly enough to be able to explain details satisfactorily, as Aristotle remarks in his *Metaphysics;* but his great service was that he turned philosophy from thought about things to the consideration of thought itself, and made that one of the most important subjects of speculative inquiry thereafter. Anaxagoras was also classed by Eudemus among the Greek geometricians. Plutarch ascribes to him a work on the quadrature of the circle, and asserts on the authority of Vitruvius that he wrote a theory on perspective. Consult Zeller, *Geschichte der griechischen Philosophie* (Leipzig, 1893). The fragments are edited by Schaubach (Leipzig, 1827); Schorn (Bonn, 1829); Ritter and Preller, *Historia Philosophiæ* (seventh edition, Gotha, 1888); and Lange, *History of Materialism*, Eng. trans. (Boston, 1886).

AN'AXAR'CHUS (Gk. Ἀνάξαρχος, *Anaxarchos*). A native of Abdera, who accompanied Alexander in the Asian expedition, and was highly prized by him as a counselor and friend. He was cruelly put to death by the Cyprian prince Nicocreon. Consult Zeller, *Geschichte der griechischen Philosophie* (Leipzig, 1893).

ANAX'IMAN'DER (Gk. Ἀναξίμανδρος, *Anaximandros*) (610-546 B.C.). A Greek mathematician, astronomer, and philosopher. He was born at Miletus, the son of Praxiades, and was a disciple and friend of Thales, whom he succeeded as the head of the Ionian School. He is said to have discovered the obliquity of the ecliptic, and certainly taught it. He appears to have been the first to introduce in Greece the *gnomon* (an instrument for determining the solstices), and the *polos* (sun-dial). The invention of geographical maps is also ascribed to him. According to Simplicius and Diogenes, Anaximander approximated the size and distances of the planets, constructed astronomical globes, and wrote a work on geometry in prose. He seems to have conceived of the universe as a number of concentric cylinders, of which the outer is the sun, the middle the moon, and the innermost the stars. Within these all is the cylindrical earth. As a philosopher, he speculated on the origin (ἡ ἀρχή, *hē archē*) of the phenomenal world; and this principle he held to be the infinite or indeterminate (τὸ ἄπειρον, *to apeiron*). This indeterminate principle of Anaximander is generally supposed to have been much the same with the chaos of other philosophers. From it he conceived all opposites, such as hot and cold, dry and moist, to proceed through a perpetual motion, and to return to it again. Of the manner in which he imagined these opposites to be formed, and of his hypothesis concerning the formation of the heavenly bodies from them, we have no accurate information. It would seem, however, that he did not believe in the generation of anything in the proper sense of the word, but supposed that the infinite atoms or units of which the ἀρχή, or primary matter, is composed, merely change their relative positions in obedience to a moving power residing in it. Consult Zeller, *Geschichte der griechischen Philosophie* (Leipzig, 1893).

AN'AXIM'ENES (Gk. Ἀναξιμένης). A Greek historian, born in Lampsacus, Asia Minor, in the fourth century B.C. He was a pupil of Zoilus and Diogenes; is said to have taught Alexander rhetoric, and to have accompanied him in the Persian expedition. He wrote histories of Philip of Macedon, of Alexander, and of Greece, of which a few fragments exist. The rhetoric addressed to Alexander, found among the writings of Aristotle, is also attributed to him.

ANAXIMENES. A Greek philosopher, who was born at Miletus, in Asia Minor, and flourished about 546 B.C. He held air to be the first cause of all things, or the primary form of matter, from which all things are formed by compression. Consult Zeller, *Geschichte der griechischen Philosophie* (Leipzig, 1893).

ANAYA, ȧ-nä'yȧ, PEDRO MARIA (1795-1854). A Mexican general. He was born at Huichapan, and in 1811 joined the Mexican army, in which he attained the rank of brigadier-general in 1833. During the Mexican War General Anaya took part in the battle of Churubusco (q.v.), on August 20, 1847. He was Minister of War under Herrera, in 1845; was Secretary of War under Arista, in 1852; was Acting President of Mexico while Santa Anna was resisting the advance of Scott (April 2—May 20, 1847), and during the absence of President Peña y Peña (September 26, 1847—January 8, 1848). Upon Santa Anna's restoration (1853) he became Postmaster-General, and retained that post until his death.

AN'BURY (probably from A. S. *ange*, vexation, trouble + *berry*). A disease of cabbage, turnips, and other cruciferous plants. See CLUB ROOT.

ANCACHS, ȧn-käch'. A maritime department of Peru, bounded by the department of Libertad on the north, Huánuco and Junin on the east, Lima on the south, and the Pacific on the west (Map: Peru, B 5). Area, 16,567 square miles. The greater portion of the surface is mountainous, but there is some good agricultural land. The mineral deposits are supposed to be very important, but are little worked. There is a railway line running through the State from Chimbote to Huaraz, the capital. The population was estimated in 1896 at 428,703.

ANCÆ'US (Gk. Ἀγκαῖος, *Ankaios*). A name of two of the Argonauts of Greek legend. (1) A son of Poseidon, who became steersman of the Argo. He is noted for the prophecy that he should not live to taste wine from his own vineyard. At the moment when at length he did lift a cup of its vintage he was told that "there's many a slip 'twixt the cup and the lip," and just then the noise of a wild boar which had got into the vineyard called him away. He was killed by the animal, and so fulfilled the prediction. (2) A son of Lycurgus the Arcadian. He was killed by the Calydonian boar.

ANCELOT, äɴs'lō', JACQUES ARSÈNE POLYCARPE (1794-1854). French dramatist, novelist, and poet, born at Havre, who won fame and a pension in 1819 by his tragedy *Louis IX*. His other serious dramas are not noteworthy; but an epic, *Marie de Brabant*, and a novel, *L'homme du monde* (1829) attracted attention. The Revolution of 1830 cost him his pension, and he became a fertile purveyor of light dramas, farces, and vaudevilles of doubtful morality. Very readable are the graceful verses of his epigrammatic satires, *Epîtres familières* (1842); but *Louis IX.*, his first considerable work, remains his best. His wife, Marguerite Louise Virginie Chardon (1792-1875), collaborated with him, and wrote independently plays and novels.

AN'CESTOR (M. Engl. *ancessour*, from Lat. *antecessor*, a predecessor, foregoer). In the English law of inheritance, the person from whom one may inherit real property. It is the correlative of heir. The term is sometimes loosely used as signifying a progenitor; but properly, in this legal usage, an ancestor need not be a progenitor, as one may inherit from his collateral relatives as well as from an ancestor in the direct line. See HEIR; SUCCESSION.

ANCESTOR WOR'SHIP. See MAN, SCIENCE OF.

ANCHIETA, ȧn-shyā'tȧ, JOSÉ DE (1533-97). A Portuguese Jesuit missionary, called "Apostle of Brazil;" related to Loyola. He was born at Luguna, in Teneriffe, Canary Islands, and in 1553 went to Brazil, where he founded the first college for the conversion of natives, and was appointed governor of the converted Indians. Both the Portuguese and savages ascribed to him the working of miracles. He died near Espirito Santo. His work on the *Natural Productions of Brazil* was published by the Academy of Sciences at Madrid. Consult: Rodriguez, *Vida del Padre J. de Anchieta* (1618), and Vasconcellos, *Vida do Padre Joseph de Anchieta* (1620).

ANCHISAURUS, ăṉ'kĭ-sạ'rŭs (Gk. ἀγχι, *anchi*, near + σαῦρος, *sauros*, lizard). The best known of the dinosaurian reptiles that lived on the marshes, flood-plains and beaches of the Connecticut estuary during the Triassic Period. Two species are known, quite perfect skeletons of both of which have been found; the larger, *Anchisaurus colurus*, having had a slender, delicate body about six feet long, which length is hardly one-tenth that of many of the enormous dinosaurs found in the Jurassic rocks of the Western States. These carnivorous Anchisauri had small, bird-like heads with large eyes, and beaked jaws, each provided with eighteen teeth, and had long, slender, bird-like necks. The form and number of the bones of the tail indicate that this member was slender, round, and usually carried free from the ground. Anchisaurus, with its short fore legs, that seldom touched the ground, and its four-toed hind feet, the first digits of which were so weak as to render them incapable of making impressions upon the firm, moist sands of the beach, was in all probability the reptile that made many of the well-known "bird-tracks" of the Connecticut Valley sandstone. See DINOSAURIA.

ANCHISES, ăṉ-kī'sēz (Gk. Ἀγχίσης, *Anchisēs*). In Grecian legend, a descendant of the royal house of Ilium (Troy), and the father by Aphrodite (Venus) of the Trojan hero Æneas (q.v.). He had been commanded not to reveal the maternity of the child, but disclosed the secret to his companions, and was made blind (one legend says killed) by lightning from Zeus. At the fall of Troy, his son bore him away on his shoulders, and Vergil describes their voyage to Italy and Sicily, where the old father died and was buried at Drepanum (Trapani).

ANCHITHERIUM, ăṉ'kĭ-thē'rĭ-ŭm (Gk. ἀγχι, *anchi*, near + θηρίον, *thērion*, wild beast). One of the three-toed fossil horses of Middle Miocene Tertiary time, remains of which have been found in North America and Europe. The animal was of the size of the Shetland pony, and had the middle toe of each foot well developed, while the lateral toes, one on each side of the middle toe, though of a length sufficient to reach the ground, were of such delicate construction as to be incapable of supporting any weight. Anchitherium was at one time thought to be one of the ancestors of the modern horse, but is now considered to represent an offshoot from the main line of evolution of the horse, although it lived at the same time and in company with the direct horse ancestors. A complete skeleton of Anchitherium affine, found at Pawnee Buttes, Colorado, in 1901, is on exhibition in the American Museum of Natural History in New York City. For descriptions of other forms of fossil horses, the reader is referred to the article on HORSE, FOSSIL.

AN'CHOR (Lat. *ancora*, Gk.. ἄγκυρα, *ankyra*, akin to Engl. *angle;* literal meaning, "something crooked, hooked"). A heavy instrument designed to rest on the sea bottom, and, by means of a cable or rope, hold a vessel, buoy, or other floating object in a desired position. Anchors for buoys frequently consist merely of heavy blocks of stone, but those for ships are now almost invariably of iron or steel. Many forms of anchors were used by the ancients. The earliest consisted of stones, or baskets of stones, which acted merely as weights without hooking into the ground; these were followed by hooked sticks, weighted to make them sink, and having only one arm. Other arms were eventually added, so that the anchors resembled the modern grapnel. The earliest recorded use of anchors was by the Egyptians on their Red Sea galleys, while the Greeks are credited with having used the first iron anchor. Greek vessels had several anchors, one of which, called the "sacred anchor," was never let go until the ship was in dire distress; and a similar custom was, for many years, observed in the British Navy. All sea-going vessels ordinarily carry several anchors. Two of these, at least, are carried well forward, one on each bow, and are therefore called *bowers*, and are designated as the *port bower* or *starboard bower*, according to the side of the ship on which they are carried. In addition to these, large vessels carry one or two anchors of about the same size, called *sheet* anchors. They are stowed like the *bowers*, but usually some distance further aft, and, not being intended for immediate use, are generally securely lashed in place.

A *stream* anchor is a light anchor, not more than half as heavy as one of the bowers, and usually about one-fourth. It is often very useful. Very light anchors are called *kedges*. In the United States Navy the weight of a battleship's bower or sheet anchor is from 14,000 to 18,000 pounds. Stream anchors (the term "stream" is not now much used) weigh from 1,000 to 3,000 pounds, and kedges from 100 to 1,000 pounds. Smaller anchors are carried for the boats. For the purpose of grappling and holding to such objects as a vessel's rigging, trees on shore, chains and the like, a small instrument called a *grapnel* is used. It has no stock, but has several arms, each sharply pointed. They were much used in "cutting out" expeditions in the days when such enterprises were common. The grapnel, with a short length of chain attached, as the enemy would have severed a rope with their cutlasses, was thrown into the rigging of the ship attacked. This enabled those of the attacking party, in a tideway, or when the ship attacked was moving, to keep alongside until they could clamber on board. Grapnels are still issued for use in boats in the United States Navy, and a large folding grapnel, with straight hinged arms, is used to some extent in naval boats in place of an anchor of the customary shape. Anchors were formerly made of wrought iron, but are now very largely made of cast steel. There are two types in use, the old, or ordinary type, in which the stock is at right angles to the arms, and patent anchors, which have no stock at all, or if they have, it lies in the same plane with the arms. The shape of the ordinary anchor is familiar, and is shown in Fig. 1. The main body is called the *shank;* at one end it joins the arms, and at the other is pierced by a hole through which passes the iron (or steel) *stock*. The latter has a ball cast on one end; the other end is bent at right angles a few inches from its extremity, and also terminates in a ball, but the ball is removable. The stock is held in position in the shank by a raised lug, or shoulder, on one side, and by a key on the other. The bend at the end permits it to be partly drawn out and folded down along the shank. At the other end of the shank from the stock are the *arms*, which are cast or forged in one piece with it. They taper slightly toward their ends, which are called *pees*, or *bills*, and on the side toward the shank have shield-shaped pieces called the *flukes*. The faces of the flukes are called *palms*. The middle of the curve of the arms, opposite to and in line with the shank, is called the *crown*.

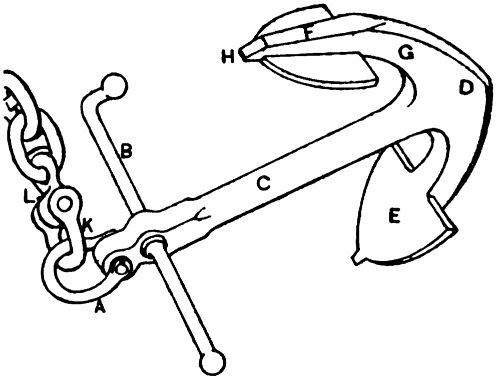


FIG. 1. ANCHOR.

A	Ring	*F*	Fluke
B	Stock	*G*	Arm
C	Shank	*H*	Bill
D	Crown	*K*	Shackle or Jewsharp
E	Palm	*L*	Club-link

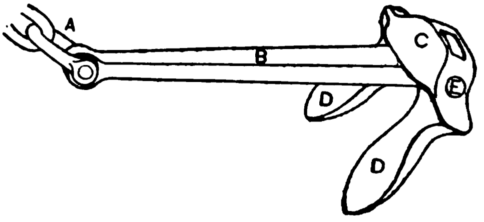


FIG. 2. PATENT ANCHOR.

A	Ring	*C*	Crown
B	Shank	*DD*	Flukes
E	Pivot		

Patent anchors differ in details of design, but in all of them the arms are pivoted to the shank, usually by a very heavy bolt. The flukes are enlarged, and lie in the same plane with the arms and shank when the former are in mid-position. When the anchor is on the bottom, the arms turn, the flukes droop, and, pointed downward, are forced into the ground. To assist in preventing the anchor from being capsized by a side pull on the chain, some patent anchors are fitted with short stocks, which lie in the same plane as the arms when the latter are in mid-position. When an anchor of ordinary type is let go, it strikes on the crown and then falls over and rests on one end of the stock. The first pull of the chain *cants* it (i.e., tilts it over), laying the stock flat on the bottom and pointing one of the bills fair for entering the ground. Additional pulls serve to drive the bill and fluke into the ground to a depth which depends upon the strain upon the chain and the softness of the bottom. The principal points of excellence in an anchor are: Holding-power under various conditions, strength, quick-holding, quick-tripping, exemption from fouling, facility of stowing, facility of sweeping, canting, facility of fishing in a heavy sea, and facility of transport in, or by, boats. Slight differences of design make considerable difference in the holding-power of anchors. For an ordinary anchor the most favorable angle for the palm is thought to be a little less than 45 degrees from the middle line of the shank, but in most patent anchors the flukes are permitted to droop not more than 35 degrees. The shank of all anchors projects a short distance beyond the stock, where it is fitted with a heavy ring or shackle called the *ring;* the ring in turn is secured to the chain by a heavy shackle called the *jewsharp*, the jaws of which embrace the club, or body, of a *club-link;* beyond this there is sometimes an open link, and then follows the *chain*. The latter differs from ordinary chain in having a cross-piece in each link called a *stay pin*, the purpose of which is to prevent the chain from *kinking*, to which ordinary chain is liable, and which would be a most serious matter in an anchor chain, because it not only might cause the chain to part under the pull of the ship, but in letting go the anchor a *kink* formed in the *chain-locker* (the box or compartment in which the chain is stowed) might jam in a chainpipe in the deck, or in the hawsepipe, with disastrous consequences.

In the navy and in most vessels of the merchant service the anchor chain was formerly divided into lengths of 15 fathoms (or 12½ fathoms in England), called *shots*, each shot being joined to the succeeding one with a shackle. At 7½ fathoms from the anchor, and again at 37½ fathoms, were placed swivels, to prevent the chain from getting kinks by twisting. In the United States Navy the present practice is to place a swivel at 5 fathoms, and neither shackle nor swivel between that and 45 fathoms. This is to facilitate getting up the anchor. Neither swivels nor shackles fit the wildcat closely, and, if the pull is heavy, they are apt to slip and cause delay. Merchant ships anchor less frequently and in less exposed places than those which men-of-war are frequently compelled to accept for anchorage-ground, consequently less attention is paid to the details of the *ground-tackle* (i.e., anchors, chains, etc.) of merchantmen. When expecting to remain in port for more than a few days, especially if the harbor or anchorage ground is contracted, or if there is a strong tidal or river current, *mooring* is frequently resorted to. The length of chain varies with the depth of water and other considerations, but a moor at forty-five fathoms is common practice. After dropping one anchor the ship *veers* (i.e., lets run out) chain until about ninety fathoms are laid out; then the other anchor is let go; now, by *heaving in* on the first chain to forty-five fathoms and *paying out*, or veering on the second to forty-five fathoms, the ship is brought to a middle position between her anchors, and in swinging to the tide or wind will cover very much less ground than if *riding* to a single anchor, and her chain cannot sweep over an anchor and *trip* it (i.e., cause it to let go its hold).

When the ship swings, however, she may not merely move back and forth, but may turn all the way around (e.g., heading north, she may swing until she heads east, then south, and then—instead of going back to east and then north—continue the circle by heading west and then north); this will cause the chains to cross, or if the operation continues, to wind themselves around each other, and give what is called a *foul hawse*. This must be cleared by unshackling and unwinding one of the chains, the operation being called *clearing hawse*. To avoid the labor of this, and it is a very laborious task with heavy chain, a *mooring swivel* is frequently used. This is a swivel having two shackles at top and two at the bottom; the chains leading to both anchors are opened at the forty-five fathom shackles, and the parts leading from the anchors *bent* (i.e., joined) to the lower shackles of the mooring swivel while the inboard ends (i.e., those extending from the ship) are bent to the upper shackles of the swivel. The ship is now free to swing without fouling her chains, as the swivel turns with her.

Patent anchors are much used, as they are convenient in more ways than one. When on the bottom, there is no arm sticking up in which the chain can catch as the ship swings, or on which she might strike if the water is shallow. When hoisted, the absence of a stock at right angles to the arms facilitates storage; and in some ships the anchor is pulled up, without *catting* or *fishing*, into a recess for it in the bow. Anchors are hoisted by means of a capstan or windlass. The former is shaped somewhat like a huge hour-glass, but is stouter in the middle, and carries about its lower edge a recess, with ridges on the upper and lower flanges; this arrangement, in which the chain fits, is called the *wildcat*. Windlasses are like capstans, but are turned on the side, and usually have two or more wildcats. On vessels in which steam gear is not fitted to the capstan, the latter is turned by hand; long wooden bars, called *capstan bars*, are fitted into recesses in the head of the capstan and held in place by a small rope called the *swifter*, which passes through a score, or groove, in their outer ends. Small windlasses are operated by levers like pump brakes, which turn the windlass barrel by means of racks and pawls. In the older ships, the first operation of getting up the anchor consists in *bringing-to* the chain (i.e., in pulling up slack chain from the locker and putting it in the wildcat of the capstan); large ships are now usually fitted with steam windlasses, on which the chain is always in place. The next process is to release the chain from the *bitt* and *stoppers*. The former is a heavy, cylindrical iron casting securely bolted to the deck; the chain usually has one turn around it, but when the ship is pulling heavily at her anchor, owing to a strong current or heavy sea, the chain is *double-bitted* (i.e., has two turns). The *stoppers* are short lengths of heavy wire rope hooked to rings in the deck at one end and lashed with rope to the chain at the other; there are usually several stoppers on the chain, and if there is no *controller* (an iron contrivance to hold the chain from running) forward of the bitts, a stopper must now be put on the chain there. The chain is then *unbitted* (i.e., thrown off the bitt); the slack is taken in until the strain is on the windlass, or capstan, and all stoppers taken off. The *heaving in* then begins; when the chain has been hove in until any further pull is liable to cause the anchor to trip, or the ship to drag, it is said to be *hove short* or *at a short stay* (the terms *astay* and *at a long stay* are not much used), and its direction, making an angle of about 45 degrees with the surface of the water, is about parallel to the fore stay of a rigged ship.

If everything is ready for leaving the anchorage, the heaving continues until the chain is vertical, or, in nautical terms, *up and down* (the anchor is then said to be *apeak*), the anchor is *broken out* and hoisted to a convenient position at the hawsepipe, when it is said to be *up*. In old-type ships, a tackle called the *cat* was next used; a hook on the lower block of the *cat-fall* was inserted in the ring of the anchor, and the latter was *catted* by being pulled up to the *cathead*, which projected slightly from the ship's side; the *fish* tackle was then hooked to the crown, and the other end of the anchor pulled up until the shank was about horizontal and the inboard arm rested on an inclined iron plate called the *bill-board*, the latter operation constituting *fishing*. The anchor was now secured by small chains, one in the ring called the *ring-stopper;* and the other, around the shank close to the outboard arm, called the *shank painter*. One end of each of these chains led to a trigger, by striking which the anchor was *let go* with ease and certainty. Under some circumstances it is desirable to *cockbill* the anchor before letting it go. This is done by easing away the shank painter until the anchor hangs at the cathead by the ring-stopper; it is then said to be *a-cockbill*. In most modern ships there is secured on the shank of the anchor, at the balancing point, a link called the *balance-link*. When the anchor is hove up to the hawsepipe (i.e., the cast-iron pipe in the ship's bow through which the chain passes), the cat is hooked to the balance-link, and the anchor is lifted in a horizontal position and put in place on the bill-board. Instead of a cathead, this form of cat requires a heavy *cat davit*, or derrick, standing eight or ten feet above the deck, and mounted upon a swivel stand. In *letting go* the anchor, it is necessary to control the speed of the chain as it goes out. For this purpose it is *bitted* (single bitted, with one turn around the bitt); this prevents the velocity of the chain from becoming too great. When a sufficient quantity of chain has run out, the brake is put on the windlass, and the *compressor* (a curved arm which grips and holds the chain) *hauled to*. The stoppers are then put on and the chain is *secure*.

A *sea-anchor* is variously constructed; it usually floats, and is then made up of spars and canvas, or something that will not sink and will offer resistance to the water; but it is sometimes made of materials too heavy to float, and is then held up more or less by the pull on the anchor rope. Its object is to keep a boat or ship with her bow up to the seas, and so enable her to ride them better and roll and wallow about less; and it accomplishes this by being in or below the surface of the water, so that it tends to drift more slowly than the boat or ship which is exposed to the force of the wind and of the waves.

Mooring anchors are of various types and are designed for permanent moorings; they are used for holding in place large mooring buoys to which ships may secure in lieu of anchoring, or as anchors for buoys marking a channel or shoal. As has already been stated, a mooring anchor may consist merely of a heavy stone, but others are of the mushroom, or screw, form.

Mushroom anchors of one type have a saucer-shaped head, from the concave side of which extends the shank, which has a shackle in the end for the chain; the other type consists merely of the iron saucer, with the shackle on the convex side; in this second type, the anchor holds largely by suction. Screw anchors, as their name implies, are shaped like screws with very broad flanges, and are screwed down into the mud by means of a long bar called the key.

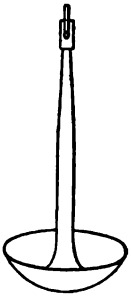


FIG. 3. MUSHROOM ANCHOR.

AN'CHORAGE, or **ANCHORAGE-GROUND.** That portion of a harbor or roadstead best suited for anchoring vessels; or, in harbors where there is much commerce or traffic, that portion in which vessels are permitted to anchor. A good anchorage is one in which the water is of sufficient but not excessive depth; in which the bottom is of such a character as to enable the anchor (q.v.) to enter in and hold (i.e., the *holding-ground* is good), and which is protected from the open sea. The practice of indicating upon charts by means of an anchor the best anchorage in any particular locality still obtains, but is falling somewhat into disuse, owing to the more definite information now given by charts and sailing directions.

AN'CHOR CHAIN. See ANCHOR.

ANCHOR DAV'IT. See ANCHOR; DAVIT.

ANCHOR ICE. See ICE.

AN'CHORITE, or **AN'CHORET** (Gk. ἀναχωρητής, *anachōrētēs*, a recluse, retired man, from ἀνά, *ana*, back + χωρεῖν, *chōrein*, to give way, retire). Literally, a person who withdraws from society; a hermit. The name was applied to those hermits who began to appear in the Christian Church in the third century, living in solitude, and not, like the monks or cenobites, in communities. During the first two centuries, Christians generally thought it enough to withdraw from the world by refusing to participate in heathen festivals and amusements; but extreme views became gradually prevalent, and were connected with a belief in the merit of celibacy, of abstinence from particular kinds of food, of self-inflicted tortures, etc. The persecutions to which Christians were subjected drove some into the solitude of deserts; afterward, the glory of a life spent in loneliness and austerity became a substitute for that of the martyr's death. The general corruption of society also caused many earnest and well-meaning persons to shun it. The ascetics (see ASCETICISM) set the example of retiring from cities to rural districts and villages; the anchorites went further, and sought to withdraw themselves altogether from mankind; and if the reputation of sanctity which was connected with a life of solitude constituted its chief attraction to some, there can be no doubt that many chose it in the hope of thereby attaining to real sanctity. Many of the anchorites voluntarily subjected themselves to the vicissitudes of the weather, without proper habitation or clothing, restricted themselves to coarse and scanty fare, wore chains and iron rings, and some dwelt on the top of pillars for many years (see PILLAR SAINTS) as extraordinary and conspicuous examples of mortification and penance, of whom the most famous is Saint Simeon Stylites in the early part of the fifth century. Saint Antony (q.v.) was one of the first and most celebrated anchorites. The anchorites were not always able to preserve their solitude unbroken. The fame of their sanctity drew many to visit them; their advice was often sought; and the number of their visitors was much increased by the belief that diseases, particularly mental diseases, were cured by their blessing. Sometimes, also, they returned for a short time to the midst of their fellow men to deliver warnings, instructions, or encouragements, and were received as if they had been inspired prophets or angels from heaven. The number of anchorites, however, gradually diminished, and the religious life of convents was preferred to that of the hermitage. The Western Church, indeed, at no time abounded in anchorites, like the Eastern, and perhaps the reason may in part be found in the difference of climate, which renders a manner of life impossible in most parts of Europe that could be pursued for many years in Egypt or Syria.

AN′CHOR-WATCH. A portion of the crew kept on deck during the night when at anchor. During prolonged heavy weather, or unfavorable conditions, the anchor-watch may be kept on deck during the day. In the merchant service one or two men form the ordinary anchor-watch; in the navy, four to ten; though in either case these numbers may be increased under special circumstances. The duties of the anchor-watch are to *veer* chain (see ANCHOR), if occasion demands it, spread or take in awnings, cover hatches, secure loose articles if the wind and sea rise; and, in fact, act as a general guard when the greater part of the crew is asleep.

ANCHOVY, ăn-chō′vĭ (Of uncertain origin, perhaps literally a dried or pickled fish, from Basque *antzua*, dry). A small fish (*Engraulis encrasicholus*) belonging to the Stolephoridæ, a family closely related to the herring. It resembles the latter in general appearance, but is thicker in proportion, and is about six inches in length, having a pointed head with the upper jaw projecting, and a widely forked tail. It abounds in the coast waters of southern Europe, and especially in the Mediterranean, where extensive fisheries are carried on, particularly near Leghorn. They approach the coast from the oceanic depths to spawn in early summer, and are caught in seines, to which they are attracted by strong lights in the fishing-boats. Anchovies are salted in small barrels, and have been much used for sauces, etc., since ancient times. There are several nearly related species both on the Atlantic and Pacific coast of America and in other countries, where they also form an important food-preparation.

ANCHOVY (ăn-chō′vĭ) **PEAR** (so named from being pickled. See ANCHOVY), *Grias cauliflora*. A plant of the order Myrtaceæ. It grows in boggy places in the mountainous districts of Jamaica and other West Indian islands, attains a height of fifty feet, and has great oblong leaves two or three feet in length. The flowers are numerous, on short peduncles; they are large, whitish, and sweet-scented; the corolla consists of four petals, and the calyx is four-cleft. The fruit is an ovate drupe of a brownish russet color, crowned with the persistent calyx; the stone is marked with eight ridges. This fruit is pickled and eaten like the East Indian mango, and resembles the mango in taste.

ANCHU′SA, ăn-kū′sȧ. See ALKANET.

ANCHYLOSIS, ăŋ′kĭ-lō′sĭs. See ANKYLOSIS.

AN′CIENT DEMESNE, dē-mēn′ (O. F. *demaine*, Lat. *dominium*, Eng. *domain*). In English law, estates of great antiquity, constituting the ancient patrimonial possessions of the crown. Manors (q.v.) of ancient demesne date back to the reign of Edward the Confessor or of William the Conqueror, and appear in Domesday Book under the description of *Terræ Regis*. Though they might be alienated and held by a subject, they were properly kept in the King's hands for the maintenance of the royal dignity. Whether held by a subject or by the King, they enjoyed certain rights and immunities which were not shared by other manors, even when held by the King; especially the right to administer their own justice, free from the interference of the ordinary royal tribunals. Two important and distinctive varieties of tenure developed on these ancient demesne lands: one a privileged form of customary tenure (q.v.), midway between copyhold (q.v.) and socage (q.v.) tenure, which came to be known as *customary freehold;* and the other a peculiar form of socage tenure, which received the name of *tenure in ancient demesne*. Though these tenures still survive in England, they have been shorn of most of their peculiar characteristics and assimilated to the more usual tenures. See Pollock and Maitland, *History of English Law*, second edition (London and Boston, 1899).

ANCIENT LIGHTS. Windows that have existed so long that they have acquired an indefeasible right to the light which enters them, free from interference by the owner of the premises over which the light comes. The easement of ancient lights, so called, is the right gained by the owner of a dwelling or other building to restrain his neighbor from interfering with windows which have been in existence from time immemorial. The term does not, therefore, describe a peculiar and distinctive right, but only a method by which the familiar easement of light may, like other easements, be acquired—the method, namely, of prescription (q.v.). Ancient lights belong to the class of negative easements, which cannot generally be acquired by prescription in the United States. In England they are now regulated by statute (the Prescription Act, 2 and 3 Will. IV. c. 71), which dispenses with the old requirement of use and enjoyment from time immemorial and calls for an existence of only twenty years to create the easement. See Easement; Light, Easement of; Prescription. Consult: Gale and Whatley, *Treatise on the Law of Easements* (London, 1896), and Goddard, *Treatise on the Law of Easements* (fifth edition, London, 1896).

ANCIENT MAR'INER, The. A poem by Coleridge, published (1798) in the *Lyrical Ballads* by himself and Wordsworth. It is founded on the sailor's superstition of the sinfulness of killing an albatross, and rehearses the sufferings consequently undergone.

ANCIENT OF DAYS. A designation of God in Daniel vii : 9, 13, 22. It represents him as "the aged," "the advanced in days," possibly in contrast with the new divinities Antiochus Epiphanes had sought to introduce among the Jews. In the Ethiopic Enoch it is represented by the more idiomatic expression, "head of days" (xlvi : 2).

ANCIENT OR'DER OF HIBER'NIANS. See Hibernians, Ancient Order of.

ANCIENTS, Council of. The upper House of the Legislative Assembly in France, under the Directory, from 1795 to 1799. The chief function of the Ancients was the approval or rejection of measures submitted by the lower House, the Council of Five Hundred.

ANCILLON, äɴ'sē'yôɴ', Johann Peter Friedrich (1767-1837). A Prussian statesman and historian. He was born in Berlin, a descendant of David Ancillon (1617-92), a French Protestant, who emigrated from Metz after the revocation of the Edict of Nantes, and who became pastor of the French congregation in Berlin. Intermediate members of the same family occupied the same pastorate or were in the service of the Prussian Government. Friedrich studied theology, philosophy, and history, and in 1792 was appointed teacher of history in the Berlin Military Academy, as well as preacher to the French congregation. The publication of his *Tableau des révolutions du système politique de l'Europe depuis le 15me siècle* (4 volumes, 1803-05) secured him the appointment as royal historiographer as well as tutor of the Crown Prince. In 1832 he became minister of foreign affairs, and occupied that place until his death. He was a man of conservative views and a defender of the monarchy.

ANCKARSTRÖM, äŋ'kär-strĕm, Johan Jacob (1762-92). The assassin of King Gustavus III. of Sweden. He was a page at court and later an ensign in the Life-Guards, but in 1783 retired from military service with the rank of captain. Of haughty temper, angered at the policy of repression pursued by the crown toward the nobility, he was frequently brought to trial for incendiary speeches. In 1791, with Count Horn, Count Ribbing, Lieutenant-Colonel Liliehorn, and others, he formed a conspiracy for the murder of the King. Chosen by lot to accomplish the deed, at a ball held in the Stockholm opera-house, he approached the King and mortally wounded him with a shot from a pistol (March 16, 1792). He was condemned to death and executed at Stockholm.

ANCON, än-kōn, or Port Ancon. A seaport of Peru, in the department of Lima, 30 miles northwest of Lima. Pop., 3000.

ANCONA, ȧn-kō'nȧ (the name alludes to its situation at the bend of the sea-coast; Gk. *ἀγκών*, *ankōn*, angle, corner). The capital of the province of Ancona, in central Italy, in the division called the Marches, 132 miles northeast of Rome, lat. 43° 37′ N. and long. 13° 31′ E. It is an episcopal city, and, next to Venice, the most important Italian port on the Adriatic (Map: Italy, H 4). It is beautifully situated in the form of an amphitheatre between two promontories. The harbor has been greatly improved by the Government in recent years, and is now deep enough for large vessels. It is defended from naval attack by forts, and from the violence of the sea by two moles. The ancient mole was built by Trajan, and on it stands a triumphal arch of Parian marble designed by Apollodorus. The modern mole with the light-house was built by Clement XII., and its triumphal arch was designed by Vanvitelli. The cathedral of St. Cyriac, built in the eleventh and twelfth centuries on the site of the temple of Venus mentioned by Catullus and Juvenal, contains ten of its columns, with a very ancient dodecagonal dome. The town hall was built in the thirteenth century, restored in the fifteenth, and partially modernized in 1647. The museum contains many valuable antiquities and some valuable paintings. The principal industries are sugar refining, shipbuilding, and the manufacture of paper, sail cloth, and silk. The exports are small; the imports are salt fish, coffee, iron and steel, wheat, raw sugar, and coal. Regular steamship communication is maintained with the principal Mediterranean ports. The United States maintains there a consular agency.

Ancona is supposed to have been founded by Syracusans who had fled from the tyranny of Dionysius the Elder. It was destroyed by the Goths, rebuilt by Narses, and again destroyed by the Saracens in the tenth century. It afterward became a republic, and was later annexed to the States of the Church. In 1798 it was taken by the French, who in 1799 surrendered it to the Russians and Austrians after a long and gallant defense. In 1832, when the Roman frontiers were in the possession of the Austrians, a French squadron appeared before the harbor and landed 1500 men, who took possession of the town. It remained in their hands until 1838, when both French and Austrians retired from the Papal States. In 1849 a revolutionary garrison in Ancona capitulated after enduring a siege by the Austrians of twenty-five days. Pop., in 1881, 48,000; in 1901, 56,835.

ANCONA, Alessandro d' (1835—). A distinguished Italian critic, journalist, and professor at the University of Pisa. He was born in Pisa. During the days preceding the war of Italian independence he was active in politics, but after the peace of Villafranca he retired from political life, and for awhile edited the leading Florentine journal, *La Nazione*. In 1860 he was called to the chair of literature at the university in his native city. At the age of eighteen he published a life and critical edition of the works of the Dominican philosopher, Tommaso Campanella. Among the many volumes which he has since produced, special mention should be made of *I precursori di Dante* (1874), *Origini del teatro in Italia*

(1877), *La poesia popolare italiana* (1878); *Manuale della letteratura italiana* (1892-95).

ANCO′RA, (Ital.). The same as the French word *encore,* again, and used in demanding the repetition of a song, for which, however, the French use the word *bis,* "twice."

ANCRE, äɴ′kr′, Concino Concini, Marquis d′. A Florentine adventurer, who went to the French court in 1600 with Maria de′ Medici, queen of Henry IV. With his wife, Leonora Galigai, he exercised an unhappy influence in promoting the disagreement between the King and Queen. When, after Henry's death, the Queen became regent, Concini, as her favorite, obtained possession of the reins of government, and in 1613 was made a marshal and prime minister. He bought the marquisate of Ancre, in Picardy, and took his title from it. Because of his rapacity he became an object of detestation equally to the nobility and the people. A conspiracy was formed against him, to which the young king, Louis XIII., was himself privy, and he was assassinated in April, 1617, on the bridge of the Louvre just as he was leaving it. Vitry, a captain of the royal bodyguard, accomplished the murder. His wife was soon afterward accused of witchcraft and was executed.

ANCREN RIWLE, ăṉ′krĕn rōōl; *Middle Eng. pron.* äṉ′krĕn rụ′le (Rule of Anchoresses). An exposition of duties and rules of life, said to have been drawn up by Simon of Ghent, Bishop of Salisbury (1297), for a religious community of women at Tarrant-Kaines in Dorsetshire.

AN′CRUM MOOR. A moor in Scotland a little northwest of Jedburgh (q.v.). It was, in 1544, the scene of the defeat of 5000 English under Sir Ralph Evers and Sir Brian Latoun by a Scottish force under the Earl of Angus and Scott of Buccleuch. A defaced monument marks the spot where a Scottish maiden, named Lilliard, is said to have done prodigies of valor.

ANCUD, ăn-kōōd′ (formerly San Carlos). Capital of the province of Chiloe, Chile. It is situated on the island Chiloe, which lies near the mainland, about 575 miles south from Valparaiso, with which it is connected by steamship line. It has an excellent harbor, some manufactures and fishing interests. It was settled in 1768; was the last stronghold of the Spaniards in Chile during the war of the rebellion, surrendering to the revolutionists in 1826. Pop. 1903, 3979.

AN′CUS MAR′CIUS (?—614 B.C.). The son of Pompilia, daughter of King Numa Pompilius, and the fourth king of Rome. Following the example of Numa, he endeavored to restore the almost forgotten worship of the gods and the cultivation of the arts of peace among the Romans. But, despite his inclination for peace, he was engaged in several wars with the neighboring Latin tribes, whom he subdued and reduced to order. These Latins Niebuhr considers to have formed the original plebeians. Against the Etruscans he fortified the Janiculum, connected it with Rome by a wooden bridge, and gained possession of both banks of the Tiber as far as its mouth, where he founded Ostia as the port of Rome. He built the first Roman prison of which we read, a proof that civilization had really commenced, inasmuch as offenses then formally ceased to be regarded as private and personal matters and were treated as crimes against the community. A prison, said to be his, is still in existence near the Forum. He died in 614 B.C., after reigning twenty-four years. It is needless to add that the kings of Rome, as we know them, are not historical characters.

ANCY′RA. See Angora.

ANCZYC, än′chĭts, Wladyslaw Ludwik (1823-83). A Polish writer, born at Vilna. He studied pharmacy, but turned to literature, and wrote a number of popular Polish comedies, which are marked by keen characterization and forceful style. His works include *The Peasant Aristocrats* (1851), *The Raftsmen* (1875), and *The Peasant Emigration* (1876).

AN′DA. A genus of plants of the natural order Euphorbiaceæ, the only species of which, Anda brasiliensis, is a Brazilian tree with large yellow flowers and an angular fruit about the size of an orange, containing two roundish seeds like small chestnuts. The seeds are called in Brazil *Purga dos Paulistas,* are used medicinally in that country, and are more purgative than those of the castor-oil plant. This quality seems to depend upon a fixed oil, which is obtained by pressure. The bark of the tree roasted in the fire is accounted in Brazil a certain remedy for diarrhea brought on by cold. The fresh bark thrown into ponds is said to stupefy fish.

ANDALUSIA, ȧn′dȧ-lōō′zĭ-ȧ (Sp. *Andalucía* for Vandalusia, the Land of the Vandals). A region in the southern part of Spain, a part of the old Roman province of Bætica, which comprises the present provinces of Granada, Almeria, Malaga, Cadiz, Huelva, Seville, Cordova, and Jaen (Map: Spain, C 4). Its area is 33,700 square miles. The region is divided into Upper and Lower Andalusia. The former comprises the mountainous regions of the Sierra Morena on the north and the Sierra Nevada on the south, with the valley of the upper stream of the Guadalquivir. Lower Andalusia consists chiefly of the valley on both sides of the lower Guadalquivir. The lower regions have a very mild, almost African, climate. On the Atlantic coast the temperature is much lower, and in the highlands snow is not infrequent. The soil is very fertile, both in the mountain valleys of Upper Andalusia and in the deep valleys along the Guadalquivir, and the warm climate allows of the cultivation of many southern fruits. Oranges, olives, and sugar are cultivated successfully, while wheat, corn, and other grains ripen as early as April and yield abundant crops. The districts along the coast are generally unfruitful, and in some cases utterly unfit for cultivation. In ancient times the fertility of Andalusia was proverbial, as evidenced by the epithets applied to the region, such as "granary," "wine cellar," and "gold purse" of Spain. Even at present Andalusia is one of the most fertile parts of Spain; nevertheless, famine conditions prevailed throughout Andalusia in 1905, and thousands were obliged to emigrate. Cattle-raising is highly developed, and Andalusian breeds of horses, mules, and bulls have long been famous. The people are graceful, and their attire picturesque. Their language is Spanish with a slight admixture of Arabic. Pop., 1900, 3,548,763.

History. Andalusia, which was overrun by the Vandals in the early part of the fifth century, was probably the Tarshish of the Bible, its name in classical geography being Tartessis (a very ancient town near the mouth of the Guadalquivir having borne the name of Tartessus). From the Carthaginians, who established themselves there in the third century B.C., the country passed to the Romans, who called it Bætica, from the river Bætis (Guadalquivir). Under the Empire it attained great prosperity and assimilated rapidly the civilization of the Romans. The Vandals remained but a short time in the country and were succeeded by the Visigoths, who ruled Spain till the invasion of the Arabs, in 711. The name of Andalusia is inseparably connected with the glory of Saracen and Moorish civilization in mediæval Spain. Within its borders were situated Cordova, Seville, Granada, and Jaen, the centres of Mohammedan culture, industry, and commerce. By contrast with the gloom and emptiness of the Dark Ages in northern Europe, history has cast almost a fairy light on the plains of "smiling" Andalusia, the home of learning and art, of chivalry and humane toleration. Cordova was the Athens of the West, the seat of the arts and sciences; and later still, under the Spaniards even, "when the sun of Raphael set in Italy, painting here arose in a new form in the Velazquez, Murillo, and Cano schools of Seville, the finest in the Peninsula." The decadence of Andalusia set in with the downfall of the Caliphate of Cordova in the eleventh century and the disruption of Spanish Islam into a number of independent principalities. One by one the cities of Andalusia passed into the power of Castile. Granada alone and the surrounding *vega* held out for two centuries after Cordova, Seville, and Cadiz had fallen. The noblest of the Moorish race, fleeing before the Christian advance, crowded into Granada, and the genius of an entire nation made its home within the walls of a city; the lustre which it shed over Granada, however, was but the hectic flush of the dying Moorish civilization. In 1492 Granada was taken by the forces of united Christian Spain. Consult: Murray, *The Cities and Wilds of Andalusia* (London, 1853); Laine, "Sur les routes d'Andalousie" in *La Nouvelle Revue*, No. 115 (Paris, 1898).

ANDALUSITE, ăn′dȧ-lū̆′sīt (Discovered in Andalusia). An anhydrous aluminum silicate that crystallizes in the orthorhombic system, and is usually found in coarse, square, prismatic forms. A variety known as chiastolite or macle, consisting of stout crystals with the axis and angles of a different color from the rest, showing a colored cross, has been found in several localities, as Lancaster and Sterling, Mass.

ANDAMANS, ăn′dȧ-manz. A chain of islands politically attached to British India, situated toward the east side of the Bay of Bengal, between 10° and 14° N. lat. and about 93° E. long., 680 miles south of the mouth of the Ganges (Map: Asia, J 7). The group covers an area of 2508 square miles, and consists of the Great and Little Andamans, divided by the Duncan Passage. Three large islands, the North, Middle, and South, and several smaller ones constitute the Great Andamans; the chief of the Little Andamans are Interview, Outram, and Henry Lawrence. With the Nicobar Islands (q.v.), they form a province under a chief commissioner resident at Port Blair. Since 1858 the islands have been a penal settlement of India. Except where clearings have been made, the surface is densely covered with forests yielding valuable timber. Corn, rice, manioc, tea, potatoes, and artichokes are the chief agricultural products, and the cultivation of cacao, indigo, and coffee is being introduced. Port Blair, on the east side of South Island, and Port Cornwallis, on the same side of North Island, are two fine natural harbors. The principal islands have monthly steamboat communication with Calcutta. The Andamanese, also called Mincopies, are a physically uniform Negrito race, whose stature, however, has a wider range than generally thought. Their head-form tends to be brachycephalic, suggesting relationship with some of the natives of the Nicobar Islands to the south, and with broad-headed Negritos elsewhere. Their language, which has several dialects, seems to be unrelated to any other tongue. Their culture is very primitive, but their weapons and industrial and art products show that they have not neglected their environment. They have also, though known only to some of the older members of the more secluded communities, a mythology, with characteristic folk-lore tales. The intelligence of these people has been underestimated. The census of 1901 gives the aborigines as 1882, of whom 842 were females, divided into twelve small tribes. Lying in the route of the Arabs eastward and of the Malays westward, these islands bear traces of the influence of both, and since the establishment of the British penal colony, there is growing up a very mixed race of hybrids. The Andamanese have inhabited their territory since pre-historic times. Flower (1879) and Keane (1896) both hold that they represent a primitive or generalized type, from which, on the one hand, the African negroes, and on the other the Melanesians, may have proceeded. (See NEGRITOS.) Population, 1891, 15,609; 1901, 18,190, of which the convict element constitutes four-fifths. The convicts are employed in reclaiming land and erecting government buildings. They are policed by a force of 645 men. The Andamans are mentioned by Arabic geographers of the ninth century, by Marco Polo in the thirteenth, and Conti in the fifteenth century, who gives the signification of the name as "Gold Islands." Hopetown, on Viper Island, was the scene of the assassination by a Mohammedan convict of Earl Mayo, Governor-General of India, while on an official tour of inspection in 1872. Consult: Man, *The Aborigines of the Andaman Islands* (London, 1885), and "The Andaman Islands," in *The Indian Antiquary*, Volumes XXVIII. and XXX. (Bombay, 1899 and 1900).

ANDANTE, ȧn-dăn′tȧ (Ital., going, moving, from *andare*, to walk, go). In music, one of the five principal tempos (q.v.). It implies a somewhat slow and gentle movement, intermediate between adagio (than which it is faster) and allegro (than which it is slower). This term is often modified, both as to time and style, by the addition of other words—as andante affettuoso, slow, but pathetically; andante cantabile, slow, but in a singing style; andante con moto, slow, but with energy; andante grazioso, slow, but gracefully; andante maestoso, slow, with majesty; andante ma non troppo, slow, but not too slow; andante pastorale, slow, and with pastoral simplicity. Andante also means the slow movement or section of a musical composition.

ANDAQUI, ȧn-dä′kê. An important Indian confederacy formerly holding the head-streams of the Caqueta and Magdalena rivers and the adjoining mountain region in southern Colombia.

Before the period of the Spanish conquest the tribes had attained a high degree of civilization, attested by the ruins of temples and other edifices, with gigantic statues carved from the living rock yet to be seen in their ancient territory. A wild and warlike remnant survives in the inaccessible fastnesses at the head of Fragua River, still guarding, according to a local legend, a cavern in which are piled up the golden treasures of their ancestors. The language shows some similarities to the Chibcha, but appears to constitute a distinct stock.

ANDAS'TEE. See CONESTOGA.

ANDELYS, LES, lȧ'zäɴ'd'-lā'. An important town in the department of Eure, France, 20 miles northeast of Evreux, on the right bank of the Seine. It consists of Grand and Petit Andelys. The former dates from the sixth century, and contains the fine collegiate church of Notre Dame, built from the thirteenth to the sixteenth centuries, noted for its superb stained glass windows and valuable paintings. Petit Andelys clusters around the famous Norman castle of Gaillard, built by Richard Cœur de Lion in 1195, which was once one of the strongholds of France. The church of St. Sauveur, at Petit Andelys, is also a splendid structure, dating from the twelfth to the fourteenth centuries. The chief trade is in cloth, and there are manufactures of thread and leather. Pop., 1901, 4539.

ANDENNE, äɴ'dĕn'. A town of Belgium, in the province of Namur, 10 miles east of Namur, and nearly two miles south of the Maas (Map: Belgium, D 4). It has manufactures of paper, porcelain, and tobacco-pipes, the latter being its most famous product. There are beds of pipe-clay, quarries of marble, and lead, iron, and coal mines in the neighborhood. Pop., 1900, 7711.

ANDER, än'der, ALOYS (1821-64). An Austrian tenor, born at Liebititz, Bohemia. He appeared at Vienna in 1845, and was first to sing there the rôle of John of Leyden in Meyerbeer's *Le Prophète*. His voice was not strong, but of excellent quality.

ANDERAB, än'dẽr-äb', or **INDERAB,** ĭn'-der-äb'. A town of Afghanistan, on the northern slope of the Hindu-Kush Mountains, and on the northern bank of the Anderab, or Inderab, River (Map: Afghanistan, L 3). It is surrounded by gardens, orchards, and vineyards. It is an important post in the commerce between Persia and India. Pop., estimated at 6000.

ANDERLECHT, än'dẽr-lĕĸt. A manufacturing suburb of Brussels, Belgium (Map: Belgium, C 4). It has numerous manufacturing establishments, consisting mostly of spinning and weaving mills, dyeing works, and breweries. Pop., 1890, 32,300; 1900, 47,700; 1905, 56,830.

ANDERLEDY, än'dẽr-lā'dē, ANTONIUS (1819-92). A general of the Jesuits, born at Brieg (Valais), Switzerland. He entered the order of Jesuits in 1838, and studied philosophy and theology at Rome and Freiburg. In 1848 he came to the United States, where he was pastor at Green Bay, Wis.; and in 1851 returned to Germany, where, until 1853, he directed Jesuit missions. From 1853 to 1856 he was rector of the Jesuit seminary at Cologne. In 1856 he was appointed rector of the seminary at Paderborn, and in 1865 assumed the professorship of moral theology at the Seminary of Maria-Laach, of which he was made rector in 1869. He was appointed, in 1870, assistant to J. P. Beckx, general of the Jesuits, whom he succeeded in 1884.

ANDERMATT, än'der-mȧt, or URSEREN (the Italian Orsera). The chief town of the Andermatt Valley, in the canton of Uri, Switzerland, four miles south of Göschenen. It is 4700 feet above sea level, and is at the intersection of three of the most important Alpine highways, the road through the St. Gotthard Pass, that to the Rhone Valley, and the upper Alps road going toward the valley of the Rhine. The St. Gotthard tunnel passes underneath the valley of Andermatt. For the protection of Andermatt, a strong fort has been built to the north. The town has an active transit trade, and is a summer and winter health resort. Pop., 800.

ANDERNACH, än'dẽr-näɢ. A town in the Prussian Rhine province, situated on the left bank of the Rhine, about 10 miles northwest of Coblentz, and near the mouth of the Nette (Map: Prussia, B 3). Its old walls and gates give it quite a mediæval appearance. Among its interesting buildings are the parish church of St. Genoveva, with four towers, one of which dates back to the Carlovingian period, the ruins of the old castles of the archbishops of Cologne, the quaint watch tower, and the Rhine Gate. The town has manufactures of chemicals, perfumeries, cigars, millstones, exported to distant parts of the world, and *tuffstein*, or trass, an indurated volcanic mud, which, when pulverized and mixed with lime, makes a mortar or cement for constructions under water. Pop., in 1890, about 6000; in 1905, 8802. The town was founded by the Romans under the name of Antunnacum.

ANDERSEN, än'dẽr-sen, HANS CHRISTIAN (1805-75). A celebrated Danish writer, styled the "children's poet," whose best poetry is his prose. He was born at Odense, Denmark, April 2, 1805. The child of poor and shiftless parents, he had little instruction and few associates, but his dramatic instinct was stimulated by La Fontaine and the *Arabian Nights*, and a visit of a theatrical company to Odense, in 1818, led him to seek his dramatic fortune in Copenhagen (1819), where for four years he worked diligently, but produced nothing of note. He gained a scholarship, however, and friends, who in 1829 enabled him to publish *A Journey on Foot from Holm Canal to the East Point of Amager*, an arabesque naïvely plagiarized and parodied from the German romanticists. *Fantasies and Sketches*, sentimental and rather mawkish poems, followed in 1831, after which he made a tour of Germany, the first of many wanderings. This inspired *Silhouettes*, a book with admirable pages of description. In 1835 he essayed the *Fairy Tales*, by which he was to achieve world-wide recognition. The classic *Tinderbox* and *Big Claus and Little Claus* are also of this year. He was, however, disposed to underrate his "sleight of hand with fancy's golden apples," devoting himself to novels, *The Improvvisatore* (1835), *O. T.* (1836), and *Only a Fiddler* (1837), which gave him a European reputation for picturesque description, humor, and pathos of the romantic type. In the last, there are interesting autobiographical touches; but there is no clear character-drawing in any of them, and this lack made his repeated dramatic essays uniform failures. He was still to write delightful impressions of travel, as in *A Poet's Bazaar* (1842), *In Sweden* (1849), and

In Spain (1860). He wrote other novels, *The Two Baronesses* (1849) and *To Be or Not To Be* (1857), and an epic failure, *Ahasuerus* (1847); but the *Picture Book Without Pictures* (1840) had revealed his best talent to him as an interpreter of child nature. Between 1852 and 1862 he printed nine small volumes of stories, and finished the last of them in 1872. His last years were unharassed by criticism, and attended by all the honor and love that should accompany old age. His literary jubilee occurred in 1869, and he died at Copenhagen, August 4, 1875, after a brief and painless illness.

In appearance, Andersen was limp and very ungainly. His nose was large, his neck and limbs long and lank, and his hands and feet very large; yet he fancied himself distinguished-looking, and had a child's delight in dress and decoration. His character, too, hovered between the child-like and the childish. He never realized the limitations of his genius. He did not like children, and he was not personally attractive to them. He was a shrewd observer, but self-absorbed and out of touch with his political generation. His literary style is faulty, but it reflects marvelously the vivid imagery of juvenile fancy. He had at his finger-tips all the venerable devices of the nursery to spur attention and kindle sympathy. No writer looks at nature so wholly with the child's eyes as he, none so interpenetrates narration with the smiles, the fears, and the very intonations of childhood. His personifications may tease the adult fancy, but they are the natural drama of children. Andersen's works are Englished in ten uniform but unnumbered volumes. Mary Howitt's is still the best of many translations of the *Tales*, though it is far from faultless. A sumptuous centenary edition of the *Tales* appeared (1900) under the patronage of the Danish Government simultaneously in six languages. Andersen's *Autobiography* was compiled by Jonas (Berlin, 1879). R. Nisbet Bain's *Life of Andersen* (New York, 1895) is the best in English.

ANDERSEN, ăn′dẽr-sen, Karl (1828-83). A Danish poet. He was born at Copenhagen, studied law there, and was subsequently appointed curator of the royal museums at the castle of Rosenborg. He first became known through his *Krands paa en Arbejders Kiste* ("A Wreath for a Laborer's Coffin," 1875). He also published *Lyriske Smaadigte* ("Shorter Lyrics," 1863), *Poesier* ("Poems," 1870), *Genrebilleder* ("Genre-Pictures," 1876-81), and other works. He made a collection of Icelandic sagas (1864) and translations of Servian folk-songs.

AN′DERSON. A city and railroad centre, the county seat of Madison Co., Ind., 36 miles northeast of Indianapolis, on the Cleveland, Cincinnati, Chicago and St. Louis, the Pittsburgh, Cincinnati, Chicago and St. Louis, and other railroads, and on the west fork of the White River (Map: Indiana, D 2). An abundant supply of natural gas promotes the manufacturing industries, which include iron, steel, glass, wire nails, straw-boards, tiles, etc. The city is the centre of an extensive system of interurban electric railways, the power for the operation of which is supplied by a million-dollar plant. Anderson owns and operates its water-works and electric light plants, has several small parks and a public library. Near the city are the historic mounds of the so-called "mound builders." Anderson was settled in 1823, incorporated in 1865, and is governed under the charter of 1865, which provides for a mayor, elected every four years, and a city council of six members, controlling all the appointments. Its rapid growth is shown by the following figures of population: 1880, 4126; 1890, 10,741; 1900, 20,178; 1903 (estimated), 23,010.

ANDERSON. A city and county seat of Anderson Co., S. C., about 100 miles (direct) northwest of the State capital, Columbia, on the Blue Ridge and the Charleston and Western Carolina railroads (Map: South Carolina, B 2). It has city and school libraries, and there are handsome school buildings and churches, and a fine city hall and county court-house. The city is in a fertile cotton-growing and somewhat diversified agricultural region, and has several large wholesale stores, while among its industrial establishments are cotton and cottonseed oil mills, factories for the manufacture of fertilizers, spring beds and mattresses, overalls, collars, and other articles of apparel, lumber and flour mills, and machine shops. A notable feature of the city is a superb electric power station, ten miles distant on the Seneca River, and controlled by a private corporation, which supplies to the city and vicinity electric power for industrial enterprises as well as light. This company also controls the city's water supply. The government, under a charter of 1882, is administered by a mayor, elected every two years, and a municipal council. Town meetings are held when necessary. Anderson was settled in 1827. Pop., 1890, 3018; 1900, 5498.

ANDERSON, Alexander (1775-1870). The earliest wood-engraver in the United States. He was born in New York City, and in 1796 received his medical degree from Columbia College, but after two years he gave up his medical work and devoted his entire attention to wood-engraving. Among his best known productions are his forty illustrations of Shakespeare's plays, and the cuts for Webster's *Spelling Book*. He was commissioned by the Government to engrave plates for paper currency. Consult Lossing, *Memorial Address on Alexander Anderson*, published by the New York Historical Society.

ANDERSON, Sir Edmund (1530-1605). An English jurist, Chief Justice of the Court of Common Pleas in 1582, distinguished for zeal in the cause of the Established Church, and for harshness toward Catholics and other dissenters. In his attitude at the trials of Robert Brown, the founder of the Brownists, and of John Udall, concerned in the authorship of the Martin Marprelate pamphlets, he showed a spirit of brutal vindictiveness bent on conviction. He was one of the commissioners in 1586 to try Queen Mary of Scotland, and afterward to try Sir Walter Raleigh. He was a man of extraordinary legal learning.

ANDERSON, Galusha (1832—). An American theologian. He was born at North Bergen, N. Y., and was educated at Rochester University and Baptist Theological Seminary. He held several pastorates, became president successively of the universities of Chicago (1878-85) and Denison, O. (1887-90), professor of practical theology at Chicago in 1892-1903, when he became emeritus professor.

ANDERSON, George B. (1831-62). A Confederate soldier. He was born at Wilmington,

N. C., graduated at West Point in 1852, and in 1855 was appointed first lieutenant, serving as regimental adjutant after 1858. He resigned in 1861 to enter the Confederate service, and soon became a brigadier-general and was placed in general command of the North Carolina coast defenses. While leading a brigade at the battle of Antietam (September 17, 1862), he was fatally wounded, and died on October 16th.

ANDERSON, James, LL.D. (1739-1808). A Scotch writer on political economy and agriculture. He was born at the village of Hermiston, near Edinburgh, and lost both his parents when very young, so that the management of a large farm, which had been in the possession of the family for a long time, devolved upon him. Recognizing the practical importance of a knowledge of chemistry to a farmer, he attended the chemistry class in the University of Edinburgh, and brought the results of his study to bear on his profession. He invented, at an early period of life, the small two-horse plow without wheels, commonly called the Scotch plow, which is generally admitted to have been one of the most useful improvements of agricultural implements ever introduced. When only twenty-four years old he went to Aberdeenshire, where he rented a large moorland farm of 1300 acres. Here he remained for a considerable time, devoting his leisure hours to writing upon agriculture. His first attempt was a series of essays upon planting, which, under the signature of "Agricola," he contributed to the *Edinburgh Weekly Magazine.* In 1780 the University of Aberdeen bestowed on him the degree of doctor of laws. In 1784, on account of his pamphlet, entitled *Encouragement of the National Fisheries,* he was engaged by the Government to make a survey of the western coast of Scotland, with special reference to that object. He next began, in 1791, the publication of a periodical called *The Bee,* which was continued for three years. In 1797 he went to London, where he pursued his literary occupations with such intense assiduity that his health gradually gave way. He died on October 15, 1808. Anderson well deserves a place in any record which details the remarkable advances made by Scotland in agriculture and other sources of wealth in the latter half of the eighteenth century. His *Bee* was the type of many periodical miscellanies of a popular nature, mingling instruction with entertainment, which have since been published. He also published: *An Inquiry Into the Nature of the Corn Laws, With a View of the Corn Bill Proposed for Scotland* (1777); *Observations on the Means of Inciting a Spirit of National Industry* (1777); *An Account of the Present State of the Hebrides* (1785); *Observations on Slavery* (1789); *Recreations in Agriculture, Natural History, Arts, and Miscellaneous Literature,* 6 volumes (1799-1802). Several of the doctrines of later economists, notably the Ricardian theory of rent, are foreshadowed in Anderson's writings.

ANDERSON, Sir James (1824-93). A Scotch navigator. He was born at Dumfries, and in 1851 entered the service of the Cunard company. He commanded successively four vessels of that line, and so distinguished himself by his excellent judgment and high skill that, in 1865, he was selected to command the *Great Eastern* when that vessel was chartered to lay the Atlantic cable (see Atlantic Telegraph), and thenceforth his name becomes intimately associated with the achievements of that celebrated cable transport.

ANDERSON, John, F.R.S. (1726-96). A Scotch professor of natural philosophy in the University of Glasgow, and founder of the institution in that city bearing his name. He was born in the parish of Roseneath, Dumbartonshire. He studied at the University of Glasgow, in which, in his thirtieth year, he was appointed professor of Oriental languages. Four years later (1760) he was transferred to the chair of natural philosophy. He was greatly interested in the practical application of science, and in a spirit of philanthropy he instituted a lecture course for artisans, in addition to his usual lectures, which were erudite and technical. He continued these twice every week during the session to the end of his life. His valuable work, entitled *Institutes of Physics,* appeared in 1786. Shortly before the French Revolution he invented a form of gun whose recoil was stopped by the condensation of air within the body of the carriage; but, after having endeavored in vain to attract the attention of the British Government to it, he proceeded to Paris in 1791, and, being a sympathizer with the Revolution, presented his model to the National Convention. It was hung up in their hall with the following inscription over it: "The gift of Science to Liberty." Afterward, when the allied forces had drawn a military cordon around the frontiers of France to prevent the introduction of French newspapers into Germany, Anderson ingeniously suggested the expedient, which was adopted and proved quite successful, of making small balloons of paper, to which newspapers and manifestoes were tied, and letting them off, when the wind was favorable, for Germany. By his will he directed that the whole of his effects, of every kind, should be devoted to the establishment of an educational institution in Glasgow to be known as Anderson's University.

ANDERSON, John (1833-1900). A Scotch scientist, born at Edinburgh. He studied at Edinburgh University, and from 1864 to 1886 was professor of comparative anatomy at the Calcutta Medical College and curator of the government museum. As scientific officer, he accompanied expeditions to western China in 1868-69 and in 1874-75. In 1881 he was commissioned to make an investigation of the marine animals of the Mergui archipelago. He was a fellow of the Royal Society and a contributor to scientific journals, and published *Mandelay to Momen* (1875), *Anatomical and Zoölogical Researches* (1878), *Two Expeditions to Western China* (1876), *Fauna of Mergui and its Archipelago* (1889), and *Herpetology of Arabia, with a Preliminary List of the Reptiles and Batrachians of Egypt* (1896). His observations in the Mergui archipelago appeared in Volumes XXI. and XXII. of the *Journal* of the Linnæan Society.

ANDERSON, John Jacob (1821-1906). An American author. He was born in New York City, and graduated at the Normal School there. For thirty years he was attached to, and for twenty years was principal of, a large grammar school in New York. He wrote many text-books of history, including these: *Pictorial School History of the United States* (1863), *A School History of England* (1870), *Manual of General History* (1867); *Complete Course in History*

(1881), *A History of France* (1877), and *A History of the State of New York* (1902).

ANDERSON, Larz (1805-78). An American capitalist and philanthropist, a brother of Major Anderson of Fort Sumter fame. He was born at the "Soldiers' Retreat," near Louisville, Ky., and was educated at Harvard College. He was one of the most distinguished citizens of Cincinnati in his day, being widely celebrated for his public enterprise and numerous charities.

ANDERSON, Martin Brewer (1815-90). An American educator. He was born at Brunswick, Me., graduated at Waterville College, now Colby University, in 1840, was tutor of Latin for two years, and for seven years professor of rhetoric in the same institution. In 1850 he became editor of the New York *Recorder*, a weekly Baptist paper. In 1853 he was called to the presidency of the University of Rochester, where he remained until 1888. In 1868 he declined the presidency of Brown University. He was a vigorous and popular preacher, though never ordained to the ministry. Selections from his numerous *Papers and Addresses* were published in two volumes in 1895.

ANDERSON, Mary Antoinette (1859—). An American actress, born at Sacramento, Cal. Her father, General Anderson, was killed in the Civil War, while serving on the Confederate side. Her mother married Dr. Hamilton Griffin, and removed with him to Louisville, Ky. She was educated at the Ursuline Convent and the Academy of the Presentation Nuns in Louisville, and at the age of thirteen began to study for the stage under Charlotte Cushman. She made her début in the character of Juliet at Louisville, November 27, 1875, with such success that she was engaged for other rôles. In 1876 she traveled through the West, and in the season of 1877-78 appeared in Philadelphia, New York, and Boston. In 1884-85 she played at the Lyceum Theatre, London, and in the character of Rosalind, in *As You Like It,* opened the Memorial Theatre at Stratford-on-Avon. From 1885 to 1889 she played in Great Britain, her chief parts being Juliet, Bianca in *Fazio*, Julia in *The Hunchback;* Evadne, Meg Merrilies, Pauline, Galatea, Clarice, in *Comedy and Tragedy;* Parthenia, Rosalind, and Perdita, in *A Winter's Tale,* in which she achieved her greatest success. Illness in 1889 compelled her to retire from the stage. In 1890 she married Antonio Navarro de Viana, of New York, and soon decided not to return to the stage.

ANDERSON, Rasmus Björn, LL.D. (1846—). An American scholar and author. He was born at Albion, Wis., graduated in 1866 at Luther College (Decorah, Ia.), and in 1869 at the University of Wisconsin, where from 1875 to 1883 he was professor of Scandinavian languages and literature. From 1885 to 1889 he was United States minister to Denmark. In 1898 he became editor at Madison, Wis., of *Amerika*, a Norwegian journal. His publications include *The Scandinavian Languages* (1873), *America Not Discovered by Columbus* (1874), *Viking Tales of the North* (1877), and translations of Brandes's *Eminent Authors in the Nineteenth Century*, and of the works of Björnson (7 volumes).

ANDERSON, Richard Henry (1821-79). A Confederate soldier. He was born in South Carolina, graduated from West Point in 1842, and served as second lieutenant in the Mexican War. He took part in the southern line of operations, and became first lieutenant in 1848 and captain in 1855. He resigned from the regular army (May, 1861), became a Confederate brigadier, assisted in the bombardment of Fort Sumter, and served with great gallantry throughout the war, distinguishing himself especially at Fair Oaks, Gaines's Mill, Frazier's Farm, Bull Run, and Gettysburg, where he commanded a division. He rose to the rank of major-general (August, 1862), and of lieutenant-general (May, 1864). In the final campaign he commanded the fourth corps of General Lee's army.

ANDERSON, Robert (1805-71). An American soldier. He was born near Louisville, Ky., and graduated at West Point in 1825, and served in the Black Hawk War of 1832 as colonel of the Illinois volunteers. He was instructor of artillery practice at West Point, 1835-37; served in the second Seminole War, 1837-38, and in 1838 was brevetted captain and became assistant adjutant-general on General Scott's staff. He took part in the Mexican War, and was severely wounded at Molino del Rey. In November, 1860, he took command in Charleston harbor, and was for fifteen weeks confined to Fort Sumter by the Confederates. On April 14th, after a bombardment of 36 hours, he was compelled to evacuate the fort. (See Fort Sumter.) He was appointed brigadier-general in the United States Army in May, 1861, and sent to command the Department of the Cumberland; but, owing to the failure of his health, he was relieved from active duty in October, 1861, and was retired from the service in October, 1863. In 1865 he was brevetted major-general. He translated and adapted from the French *Instructions for Field Artillery* (1840) and *Evolutions of Field Batteries* (1860). He died in France.

ANDERSON, Robert (1750-1830). A Scotch editor and biographer of the English poets. He was born at Carnwath, Lanarkshire; studied theology and afterward medicine in the University of Edinburgh, and became a physician, but soon after his marriage ceased practicing, and from that time devoted himself to literature. His most important work was the compilation of *A Complete Edition of the Poets of Great Britain* (14 volumes, 1792-1807). He edited the *Edinburgh Magazine*, and in that capacity became the friend of many young writers, notably Thomas Campbell, who dedicated his first volume of verses to him. Consult Beattie, *Life and Letters of Campbell* (1849).

ANDERSON, Rufus, D.D., LL.D. (1796-1880). Secretary of the American Board of Commissioners for Foreign Missions. He was graduated at Bowdoin College (1818) and Andover Theological Seminary (1822), and after acting as assistant (1822-1832), became full secretary, and so continued until 1866, when he retired. He was lecturer on Foreign Missions in Andover Theological Seminary 1867-69. He was one of the great missionary secretaries, and historian of the American Board (1872-74, 3 volumes.) He inspected the Board's stations, and has left the memorial in his *Observations Upon the Peloponnesus and Greek Islands* (1830), *A Heathen Nation* (the Hawaiians) *Civilized* (1870), and in the history mentioned above. He died in Boston, May 30, 1880.

AN'DERSONVILLE. A village in Sumter Co., Ga., 62 miles south of Macon, notable as the site of a Confederate military prison during the Civil War. When established in November, 1863, the prison was an unsheltered inclosure occupying about twenty-two acres, and crossed by a small stream about five feet wide and one foot deep. Subsequently the area was increased to about twenty-seven acres, though a part of this was rendered unavailable by the establishment of a "dead line," the crossing of which by a prisoner meant immediate death. Into this area sometimes as many as 33,000 Federal soldiers were crowded, forced for the most part to live without shelter, fully exposed to the heat of summer, the frosts of winter, and the frequent storms, while they suffered terribly from the effects of insufficient and improper food. Amid surroundings of indescribable filth, they died by thousands, of diarrhea, scurvy, dysentery, and fevers. The first prisoners arrived on February 15, 1864, and the last in April, 1865, the total amounting to 49,485, of whom more than 12,800 or 26 per cent. died in confinement. In the autumn of 1864 many of the prisoners were removed to Millen, Ga., and Florence, S. C., where the conditions were much less severe. A Confederate medical commission, composed of Dr. G. S. Hopkins and Surgeon H. E. Watkins, reported in 1864 that the abnormal death rate was due (1) to "the large number of prisoners crowded together," (2) to "the entire absence of all vegetables as diet, so necessary as a preventive to scurvy," (3) to "the want of barracks to shelter the prisoners from sun and rain," (4) to "the inadequate supply of wood and good water," (5) to "badly cooked food," (6) to "the filthy condition of the prisoners and prison generally," and (7) to "the morbific emanations from the branch, or ravine passing through the prison, the condition of which cannot be better explained than by naming it a morass of human excrement and mud." The post was in command of General W. S. Winder, while Henry Wirz, a Swiss, was the prison superintendent. The latter was convicted by a special military court, in session from August to October, 1865, of "maliciously, wilfully, and traitorously conspiring to injure the health and destroy the lives" of Union soldiers at Andersonville, and of "murder in violation of the laws of war," and on November 10 was hanged. Subsequently, the tract of land where the bodies had been hastily buried was turned into a national cemetery. Of the graves, 12,789 have been identified and marked with tablets, while 925 remain unknown. Consult: Chipman, *The Horrors of Andersonville Rebel Prison* (San Francisco, 1891); Spencer, *A Narrative of Andersonville* (New York, 1866); and Stevenson, *The Southern Side, or Andersonville Prison* (Baltimore, 1876).

ANDERSSEN, ăn'dẽr-sen, ADOLF (1818-1879). A famous German chess player, born in Breslau. He studied philosophy and mathematics at Breslau and taught at the Friedrichs-Gymnasium there. In 1851 he defeated Staunton at London. In 1858 he lost to Morphy, at Paris. He won two first prizes in the World's Tournament at London in 1862, and was victorious in a number of other tournaments and matches. He was noted for the brilliancy of his style of play. His "Sixty Chess Problems" are full of deep and ingenious combinations. He also wrote several papers on the theory of chess.

ANDERSSON, än'dẽr-sôn, KARL JOHAN (1827-67). A Swedish naturalist and South African traveler. In 1850 he joined Francis Galton in a journey in southwest Africa, continued alone through 1853-54, and on his return to England published *Lake Ngami; or, Explorations and Discoveries during Four Years' Wanderings in the Wilds of South-western Africa* (1855). He made a journey to Lake Ngami in 1858 with Green, the elephant hunter. On his return he published a book on the Okavango River (1861). In May, 1866, he went on an exploration to the Kunene for the purpose of establishing commercial intercourse with the Portuguese settlements north of that river. He came in sight of the stream, but was too feeble to cross it, and died in trying to return to Cape Town. After his death, his *Notes of Travel in South Africa* (1876) were published.

ANDERSSON, NILS JOHAN (1821-80). A Swedish botanist, born at Gärdserum, Småland. In 1846 he was an instructor in botany at Upsala, and in 1847 taught in an elementary school at Stockholm. From 1851 to 1853 he was botanist to the Swedish circumnavigatory expedition, which he described in *En Verldsomsegling* (three volumes, 1853-54). He was appointed an adjunct professor and demonstrator of botany at Lund in 1855, and in 1856 professor and curator of the botanical collections at the Academy of Sciences, Stockholm, and instructor in the Bergiani horticultural school. He also published *Salices Lapponiæ* (1845), *Conspectus Vegetationis Lapponiæ* (1846), *Atlas öfver den Scandinaviska Florans Naturliga Familjer* (1849), *Monographia Salicum Hucusque Cognitarum* (1867), and other works.

AN'DERTON, THOMAS (1836—). An English composer, born in Birmingham, April 15, 1836. Although an amateur, his works are frequently played at musical festivals and concerts. These include a symphony and overtures for orchestra, string-quartets, pianoforte music, and cantatas on Cowper's *John Gilpin* and on Longfellow's *Wreck of the Hesperus*. His cantata, *Yule Tide*, has had a considerable success in America.

ANDES, ăn'dēz (Deriv. uncertain, usually explained as Copper Mountains, from the Peruvian word *anti*, copper; cf. in Germany *Erzgebirge*, Ore-Mountains, and *Bleiberg*, Lead-Mountain). The great mountain chain of South America, extending closely parallel with the Pacific coast, and nowhere far from it, from Cape Horn to the northwest coast of the South American continent. Its length is about 4500 miles, extending in latitude from 56° 30′ S. to 11° N. In a way, it may be regarded as continuous with the Cordilleras of North America, the two forming a well-nigh continuous mountain system 9000 miles in length, stretching from Cape Horn to the Aleutian Islands. The average breadth may be set at 150 miles, although this differs greatly in different parts of the system. Its average height of 12,000 feet is subject to the same qualification. Following the coast, the system trends a little west of south through Colombia and Ecuador, but on entering Peru it turns to the southeast, in which direction it extends through that country and part of Bolivia. Through south Bolivia, Chile, and Argentina, its trend is nearly south, but it swings in a broad curve to the eastward near Magellan Strait.

The mountain system rises abruptly on both sides throughout its course. Everywhere it presents a steep wall to the Pacific, and on the east it drops abruptly to the Amazon Valley; farther south, in Argentina, the land rises somewhat to meet it, and there are outlying ridges, but the main ascent is everywhere steep. The southern part of the system consists of a single range, with here and there outliers of comparatively little height, but from northern Chile and Argentina to Colombia, it consists of a high, broad plateau, capped by two or three ranges, with hundreds of high volcanic peaks, some active, others dormant or extinct.

Geologically, the system is of recent origin, although its age has not been closely determined. The material of which it is composed is in the main granites, with schists, slates, and other metamorphic rocks and the oldest of stratified rocks; here and there upturned beds of more recent formation, up to the Jurassic, lie upon the flanks of the ranges, while in Peru, the eastern range is composed largely of Silurian beds. Over all, in the neighborhood of the volcanic peaks, which are very numerous in all parts of the range, are spread lava, pumice, scoria, and ashes, in many places burying deeply the metamorphic rocks. Near the northern end, in Colombia and Venezuela, the eastern branches are composed of recent stratified rocks. For detailed description it will be convenient to refer to the countries traversed by this mountain system, and this order will be followed, commencing at the north.

COLOMBIA AND VENEZUELA. The Andes originate on the north in Colombia and Venezuela in several distinct ranges, which, trending south to southwest, meet and coalesce in the Pasto Knot in southwest Colombia. The westernmost range of magnitude is the Cordillera Occidental, which rises just east of the mouth of the Atrato, and trends southward, parallel to the coast, throughout Colombia. In this are summits 10,000 and 11,000 feet in height, the highest peaks being in the southern part. Near the boundary line with Ecuador it is cut through by the Rio Patia, which flows south and west into the Pacific. East of the Cordillera Occidental, and separated from it by the narrow valley of the Cauca, a branch of the Magdalena, is the Cordillera Central. This range rises from the lowlands between the Cauca and the Magdalena, and attains a great height, with Cumbal, 15,715 feet; Guacau, 16,683 feet; Guican, 15,748 feet; Santa Marta, 19,029 feet; Santa Isabel, 16,732 feet; Herveo, 18,045 feet; Ruiz, 17,388 feet; Sugarloaf, 16,000 feet: Tolima, 18,425 feet, and many others of equal height. The range is composed mainly of crystalline schists, while the higher peaks are volcanoes, which have spread lava and ashes over many parts of the range. East of the Cordillera Occidental and across the valley of the Magdalena, is the Cordillera de Bogota, originating in several ranges in the north of Venezuela, which trend in a general southwest direction and come together at various points; the principal ones are the Parija and Merida ranges, which unite near Bogota, beyond which point the range is single. Its highest peak is Cocui, 16,680 feet high. The range is in the main composed of strongly folded Cretaceous and Tertiary beds, and contains no volcanoes.

ECUADOR. The Andes of Ecuador form two ranges, the Cordillera Occidental, the continuation of the range of the same name in Colombia, and the Cordillera Oriental, or Real; the two are separated by a high plateau, from 70 to 100 miles wide, with an average elevation of 8000 feet; connecting cross ranges divide this plateau into ten basins or high mountain valleys. The western range is composed of porphyries, diorites, and greenstone, and the eastern and higher range is composed of gneiss, schist, and granite. Above them tower many high volcanic cones, which have spread lava and ashes over great areas. The great peak of the western range is Chimborazo, 20,498 feet; with Cotocachi, 16,300 feet; and Pichincha, 15,918 feet, the last named near the city of Quito, while in the eastern range are Cotopaxi, 19,613 feet; Antisana, 19,335 feet; Cayambe, 19,186 feet; Altar, 17,736 feet; Illiniza, 17,023 feet; and Carahuairazo, 16,515 feet, with the active volcanoes Tunguragua, 16,690 feet, and Sangai, 17,464 feet. The cross ranges also contain many volcanic peaks, indicating that the whole region must once have been the centre of tremendous volcanic activity.

PERU. In Peru, Bolivia, and the northern part of Chile, the system is much broader and more complex. The Andes of Peru consist of three ranges, the two westernmost being the Maritime or Black, and the Central Cordillera, trending parallel to one another and to the coast, and in the north separated only by a narrow, high plateau, known as the Puna, with an average height of 12,500 feet, and in the south by the narrow valley of the Rio Huay. The Eastern Cordillera, though otherwise continuous, is cut through by no less than six of the head tributaries of the Amazon. The broad, elevated region lying between this and the Cordillera Central, known as the Sierra, is broken by mountain spurs, with broad valleys and plateaus. East of the Eastern Cordillera, or the Andes, as it is locally known, are several lower ranges, trending parallel with the system, and separating tributaries of the Amazon. The Maritime and Central Cordillera are composed of crystalline and volcanic rocks, with stratified beds of Jurassic age resting upon their outer flanks. The Eastern Cordillera is composed mainly of stratified beds of Silurian age, with some intrusions of granite. These ranges are connected at the mountain knot of Cerro de Pasco, 14,283 feet high, and again farther to the southeast, at the Knot of Vilcanota, 17,390 feet. South of this latter peak the Central and Eastern Cordillera enclose the lofty plateau on which is Lake Titicaca, situated partly in Peru and partly in Bolivia, and 12,545 feet above the sea. North of the Cerro de Pasco, the Sierra comprises the upper valley of the Marañon, the largest and longest of the head branches of the Amazon, which cuts through the Eastern Cordillera just south of the Ecuador frontier. Between the Cerro de Pasco and the Knot of Vilcanota, the Sierra is drained by the head streams of the Ucayali, a large tributary to the Amazon. These streams also cut gorges through the eastern range. This region was the site of the ancient Inca civilization, and is still thickly settled. Among the high peaks of this part of the Andes are Huascan, 22,051 feet; Huandoy, 21,089 feet; Misti, 20,013; Chacani, 19,820 feet; and Tutupaca, 18,960 feet.

BOLIVIA. In Bolivia the system comprises two main ranges, one of which is formed by the coalescing of the two westernmost of the Ecuador ranges. These ranges are widely separated and enclose a broad, greatly elevated plateau, 125 miles in breadth in the northern part, and nearly 300 miles in the south, with an altitude of almost 13,000 feet. The plateau of the Andes has here the greatest lateral extent and altitude in the entire system. The western range has an average altitude of 15,000 feet, while the Eastern, or Cordillera Real, is still higher, having peaks exceeding 20,000 feet; among them are Illampu, 21,490 feet; Illimani, 21,030 feet; Ancohuma, 21,490 feet; Haina, 20,171 feet; Paniri, 20,735 feet; Licancaur, 19,521 feet; Sajama, 21,047 feet; Isluga, 17,060 feet; and Cacaca, 20,250 feet, all of them near Lake Titicaca. East of this range are several lower subsidiary ranges, which form a complicated system. Lake Titicaca drains southeastward into Lake Poopo, a sink which collects the waters from a large area of the plateau. In the Cordillera Real and the lesser ranges to the east, rise tributaries of the Madeira, one of the main branches of the Amazon, and of the Pilcomayo, tributary to the Plata.

CHILE AND ARGENTINA. The broad, high plateau, with its bordering ranges and subsidiary eastern ranges of Bolivia, extends southward into these countries, gradually narrowing and decreasing in altitude, until in latitude 32° the Andes become reduced to a single range, except for spurs and outliers, most of which are of comparatively little importance. In the northern part the altitude of the ranges decreases greatly, Juncal, in latitude 26°, having a height of 17,530 feet, and Copaipó volcano, 19,760 feet. Farther south, in the neighborhood of Santiago, the mountains again become loftier. Here are Mercedario, 22,315 feet; Tupungato, 20,286 feet; San Jose, 20,020 feet; and Aconcagua, 22,860 feet; this latter peak is the highest summit of the entire system, and of the whole continent, so far as known. Still further south, the range again diminishes in height. In latitude 34° is Maipo volcano, 17,670 feet; in latitude 36° is Descabezado, 12,760 feet; in latitude 42° is Tronador volcano, 9790 feet. Here begins the remarkable fiord coast, which extends south to Cape Horn. The heavy precipitation on the west side of the range here produced in past times extensive glaciers, which chiseled the mountains far down below sea level, producing many islands, and an intricate system of mountain-walled channels. These glaciers have been able, by reason of their rapid descent, to cut back their heads across the range in many places, so that now, after their recession, many of the streams which have succeeded them rise far to the east of the Andes, upon the plains of Argentina, and flow through the range to the Pacific. In this region the mountains become still lower, their height ranging from 4000 to 8000 feet, until they finally disappear at Cape Horn.

The lower limit of perpetual snow, although an extremely indefinite line, varying from year to year with exposure and precipitation, has in general, in equatorial regions, an altitude of about 15,500 feet, but ranges a thousand feet on each side of this figure, being higher on the east and lower on the west side of the range. In other words, it is higher where the precipitation is abundant, and lower where it is scanty. It diminishes as the latitude increases, being about 13,000 feet in the latitude of Santiago, and falling to 3000 feet near the southern point of the continent. Glaciers are found on all the high peaks, even those in equatorial regions, which exceed 13,000 feet in height. Here, however, they are small, descending the mountain slope only a few thousand feet. In southern Chile, on the west side of the range, are many of considerable size, originating upon mountains of inferior height, and descending to sea level, even entering the sea, at the heads of fiords.

VOLCANOES. One of the striking features of the Andes is its great number of active and extinct volcanoes. Probably not over sixty are now known to be active, but the extinct ones are numbered by hundreds, and have played a very important part, though a secondary one, in creating the present conformation of the mountain system. Three principal centres of volcanic activity are recognized; one in the Andes of the north, in Colombia and Ecuador, extending in latitude from 5° N. to 3° S.; a second in Peru, Bolivia, and northern Chile, extending in latitude from 15° to 28° S.; and a third in central Chile, extending from 32° to 40° S. The highest peaks of the Andes are of volcanic formation, and their peculiar conical forms are distinctive features of the Andean landscape. Many of the most prominent and highest ones have been mentioned; it remains to speak of those which are now active, or which have been active within historic times, and briefly describe their eruptions.

The northern group, mainly comprised in Ecuador, is the most imposing collection of active and extinct volcanoes on earth. Of these, Cotopaxi, Tunguragua, Sangai, and Pichincha have repeatedly been in eruption in historic times, but most, if not all, of the others have for a long time been quiescent. The Altar, a truncated mountain, 17,736 feet in height, is said to have once been the highest in the region, but after a long period of eruption it collapsed within itself. Ruiz, in Colombia, is still smoking, and Tolima is not quite extinct, but as late as 1829 was in eruption. In 1849 Purace, in southern Colombia, suddenly exploded, flooding the neighboring country, and covering it with ashes. A similar eruption took place in 1869. Imbabura, in Ecuador, is said to have discharged a deluge of mud and water at the time of the great earthquake in 1868. Antisana is reported as having been in eruption in 1590, and even now sulphurous fumes arise from it. Cotopaxi, always smoking, has been repeatedly in eruption, although its great eruptions have occurred at intervals of centuries. The last one was in 1877. Tunguragua also is active at irregular intervals, the latest eruption being in 1886. Sangai sends off steam constantly with tremendous force and noise. Pichincha has, since its eruption in 1660, given off nothing but steam and a little ashes.

The middle volcanic group is found in both the eastern and western Cordilleras; in Peru it includes Sarasara, Atchatayhua, Corupuna, Ampato, Chachani, and Misti, all now quiescent. Omate and Tutupaca have been in eruption in historic times; indeed, the former was one of the most active in Peru. In Bolivia are Mount Sorata, or Illampu, Sajama, Aucaquilcha, Chachacomani, Huiana, Cacaca, Mesada, and Illimani, while in northern Chile are many volcanic cones, some of great height: among them are Tacora, 19,750 feet, Chipicani, Pomerape, Parinacota, Iquima, 20,275 feet, and Toroni, 21,340 feet, all in the western range. In the eastern range are Tuachela, Olca, Mino, and Ollagua, all smoking or emitting lava. South of Ollagua are at least thirty extinct volcanoes, exceeding 16,500 feet in height; among them are Autopalla, 20,920 feet, Socompa, 19,620 feet, and Llullaillaco, 21,670 feet.

In the central Chilean region are Tupungato, San Jose, Maipo, Tinguiririca, all supposed to be extinct. Las Damas and Peteroa are said to have been in eruption in the last century. The volcanoes grouped about Descabezado are quiescent, though appearances indicate recent eruption. Chilean ranges contain several vents, from which lava and ashes have been ejected in recent years. Autuco also has had eruptions within historic times. Farther south, Villarica volcano has frequently been seen in eruption. In all probability, other active volcanoes exist in the fiord region of South Chile, although none has yet been reported.

HYDROGRAPHY. The Andes system is the source of most of the larger streams of South America. Through nearly its whole extent, wherever the system comprises more than a single main range, the westernmost of these ranges separates the drainage to the Atlantic from that to the Pacific. In Ecuador, however, no fewer than seven of the ten high valleys between the ranges are drained westward, and in southern Chile, as has been seen, glaciers have eroded their sources back across the whole range to the Argentina plains. The western streams are short, and owing to the light rainfall on most of the western slope, have small volume. Hence their cutting power is slight. On the other hand, the streams to the east are long, with great drainage basins, and, except in Argentina, are supplied with abundant precipitation by the trade winds. Hence they are powerful streams of large volume, and have eroded their courses far up into the mountains.

The Andes of Colombia are drained northward to the Caribbean Sea by the Magdalena, Cauca, and Atrato rivers, and eastward to the same body of water by the Orinoco, and to the Atlantic by the Negro and Yapurá, great branches of the Amazon. The system in Ecuador, Peru, and most of Bolivia is drained eastward by countless tributaries of the Amazon, among which are the Napo, Marañon, Ucayali, Beni, and Mamore. Of these, the Marañon heads between the ranges far to the south, near the Knot of Cerro de Pasco, flowing northwest within the mountain system for 400 miles before breaking through the eastern range into the Amazon basin. The Huallaga, Mantaro, Apurimac, and Urubamba, tributaries of the Marañon, also head between the ranges, cutting gorges through the eastern range. In Bolivia and northwest Argentina is a great region, 800 miles in length, lying between the ranges, with an average altitude of 13,000 feet, which has no drainage to either ocean. In this region is the great Lake Titicaca, which drains by the Rio Desaguadero to Lake Poopo, where the drainage of this semi-desert region is collected. This lake in earlier times drained to the Amazon, but by shrinkage in volume its outlet has been closed, and now it discharges only by evaporation. The eastern slope of the Andes in southern Bolivia and northern Argentina is drained to the Plata, while farther south shorter streams, the Rio Colorado, the Negro, Chubut, and the Deseado, and the Arroyos Bayo and Salado, and other smaller streams, carry the drainage directly to the Atlantic.

CLIMATE. The climate of the Andes differs widely in different parts, with latitude, altitude, and exposure. The eastern slope of the system from the northern end southward to latitude 25°, comprising the portions drained by the Orinoco and Amazon, and lying almost entirely within the tropics, has a heavy, and, in many localities, a profuse, rainfall. Farther southward in the temperate zone, in the region of prevailing westerly winds, the rainfall on this side of the range diminishes, becoming very light in Argentina, with only eight inches or less in the driest parts. On the west side of the system, the rainfall conditions are very nearly reversed, though in the north, in Colombia, the tropical rainfall passes around the end of the range and extends down the western side for some distance, giving to the valleys of the Magdalena, Cauca, and Atrato abundant moisture, and extending southward along the coast as far as Guayaquil, Ecuador. Thence southward, the western coast is an arid and desert region, as far as latitude 30° S. Below this point the precipitation increases, as the westerly winds bring moisture, and the southern coast is well watered.

From Guayaquil a cooler climate is reached either by going south or by going directly up the mountains. The base of the mountains, within the tropics, has a mean annual temperature of 80° F. or more, while in southern Argentina it is not more than 25°. Within the tropics the temperature ranges from 80° at the base of the mountains to 20° or less at their summits, a range due to altitude alone. Upon the Titicaca plateau Arctic conditions prevail, with frost every month of the year. Where the rainfall is copious, as it is on the eastern side within the tropics, the range of temperature between summer and winter is slight, while upon the west coast, in the same latitudes, where desert conditions prevail, the range is very great. In general, as the mountains are ascended, the contrasts of temperature become greater, owing to the rarefaction of the air. At great altitudes, even, the contrast between day and night is great. South of the latitude of Coquimbo, 30° S., these temperature conditions are reversed, the west slopes having the smallest annual and diurnal range.

MEANS OF COMMUNICATION. Routes of travel across the Andes are few in number, the passes are very high, and the roads traversing them are, as a rule, very bad. Communication between the peoples on the two sides of the mountains is slight. The high land between the ranges is the best settled part of these sparsely settled countries, and the inhabitants of these elevated regions have some intercourse with the western seaboard, but very little with the low country to the east. But with the development of the mining industry in the mountains and the exploitation of the rubber resources of the upper waters of the Amazon, it may be expected that means of communication across the range will be improved in the near future. In Colombia the main routes of travel follow the valleys of the Cauca and the Magdalena, while the chief route across the Cordillera Central is via Quindio Pass, connecting Cartago, on the Cauca, with the valley of the Magdalena, and ultimately with the capital, Bogota. In Ecuador the main routes pass north and south through the succession of mountain valleys, connecting with the coast at Guayaquil, by railroad from Chimbo, or northward down the Cauca and Magdalena. The most frequented eastward route crosses the Eastern Cordillera between Saraurcu and Antisana, and reaches navigable water in the Napo at Puerto Napo. In Peru the plateau within the ranges is connected with the coast by two railways, which are marvels of engineering. The Oroya Railway connects Lima and Callao with Oroya and Concepcion, crossing the Western Cordillera at an altitude of 15,665 feet, in a distance of 106 miles from Lima. The second railway connects Mollendo on the coast with Lake Titicaca. It crosses the Western Cordillera at an altitude of 14,666 feet, and terminates at the little town of Puno, on the shore of Lake Titicaca, 12,540 feet high. Several other short lines run from the coast to the foot of the mountains and even some distance into them, following the stream valleys; among them is the line up the Rio Santa to Huaraz.

The somewhat broken character of the ranges in Peru and Bolivia has made the plateau easier of access than it is farther north, and there are many roads and trails from the coast to the summit; but routes of communication to the east, to the country about the upper waters of the Madeira and Plata, are almost entirely lacking. From Antofagasta in northern Chile, on the coast, a railway has been constructed to Oruro, on the plateau, north of Lake Poopo. This road has a total length of 560 miles, making it much the longest of the Andean lines. In central Chile and Argentina a transcontinental railway has long been in course of construction, which is to cross the Andes at Uspallata or Cumbre Pass, not far from Santiago, at an altitude of 12,340 feet. This is the most frequented pass in Chile, as almost all the transcontinental travel goes over it.

Flora. In plant life the Andes is the richest of any mountain system in the world. Not only do these mountains sustain at their bases the flora of all climates, from the equatorial zone at the north to the cold zone at the south, but they possess these zones in altitude as well; and moreover, certain species of plant life are peculiar to this special region. Plant life is especially prolific in the rainy regions of Venezuela, Colombia, Chile, and Bolivia. In Colombia the palms and their associated tropical flora extend upward on the Andean slopes to an altitude of about 4500 feet, while above this is a mixed sub-tropical belt, extending to an altitude of nearly 10,000 feet, in which grow the cinchona, tree fern, and wax palm, and still higher up, at an altitude of 10,000 to 12,000 feet, the higher Andean bush growth, including the Andean rose; a species of bamboo also grows at these high altitudes.

Farther to the south, in the region of less rainfall, the flora on the east and west sides of the Andes is quite different. On the west side, in lower Ecuador and Peru, the plant life is poor, and is that peculiar to a semi-desert region; but it extends up to high altitudes, lichens being found at 18,500 feet altitude; while on the moister Bolivian and Brazilian side the various altitudinal zones occur, beginning with the rich flora of western tropical Brazil and extending up to the true Andean flora. In northern Chile and western Argentina, where there is a rather light rainfall on both sides of the Andes, there is a continuation of the sparser vegetation of the relatively dry region, and the flora of the two sides of the Andes differs less than elsewhere. In the Chile-Argentina region there is a great contrast between the rich vegetation on the moist Chilean side and the thin vegetation on the dry slopes of Argentina. In the southern part of this Andean region great forests of stunted beech and firs occur in the lowlands and extend part way up the mountain slopes. Southward along the Andean chain the altitudinal zones diminish in width in about the same ratio as the decrease in altitude of the snow-line, so that in the south, by making an ascent of less than a vertical mile, one can pass through as many vegetation zones as would be encountered in an ascent of three miles under the equator. The upper limit of tree growth, or the timber line, is a far more definite line than the snow line, yet in many places it is not easy to define. It ranges in the Andes from an average of 11,500 feet under the equator, down to about 3000 feet near Cape Horn. It is higher, for apparent reasons, on the moist, than on the dry, side of the range; thus, in Ecuador it ranges nearly 1000 feet higher upon the east side than upon the west.

Fauna. In the northern Andes of Venezuela and Colombia, where the tropical and sub-tropical forests extend up to an altitude of 10,000 feet, we find the fauna of tropical America existing up to similar high altitudes. The jaguar, puma, bear, ocelot, monkey, tapir, ant-eater, and capibara are found in these forests. Bird life is abundant, and the bat family is well represented. Snakes, saurians, and turtles are met in great numbers at lower altitudes. Above 6000 feet in altitude there is a great diminution of animal life. In Ecuador there occur certain representative species of the southern Andes, such as the llama and the condor. Insect life also continues very abundant, and fish are found up to an altitude of 14,500 feet. In the Peruvian and Bolivian Andes on the Pacific side, the fauna, like the flora, is limited, but on the eastern or Brazilian slope is exceedingly rich. The vicuña, guanaco, and alpaca are still found in the wild state, and with them are found the chinchilla and viscacha. On the Bolivian slopes the fauna is much more abundant than in Peru. Further south on the Andean chain the fauna is less rich, and the larger animals of the northern Andes are not found. Herds of guanacos are numerous, and birds are present in great variety and large numbers, but the reptiles show a decided change of form. At the extreme south the land fauna is but poorly represented.

Bibliography. Orton, *The Andes and the Amazon* (New York, 1870); Crawford, *Across the Pampas and Andes* (London, 1884); Güssfeldt, *Reise in den Andes* (Berlin, 1888); Whymper, *Travels Among the Great Andes of the Equator* (London, 1892); Fitzgerald, *The Highest Andes* (New York, 1899); Conway, *The Bolivian Andes* (ib., 1901); Reclus, *Physical Geography*, trans. Keane and Ravenstein (London, 1890-95).

ANDESINE. See Feldspar.

AN'DESITE. A volcanic effusive rock of porphyritic texture composed essentially of lime-soda feldspar (andesine) with black mica (biotite), hornblende, or augite imbedded in a ground mass of smaller crystals or rock glass. The structure may be, but is not necessarily, porous;

in most cases the crystals of andesine are arranged roughly parallel, giving the rock its characteristic fluxion or andesitic structure. This structure is due to the flow of the once molten mass in the form of lava. In composition this family of rocks shows wide variations, limited, however, by the rhyolites (q.v.) and trachytes (q.v.) on the one hand, and the basalts on the other. Fairly rich in silica and alumina, they contain moderate amounts only of the heavier and darker bases, viz., iron, lime, and magnesia. They contain from 60 to 70 per cent. of silica, 13 to 18 per cent. of alumina, 4 to 9 per cent. of iron, 3 to 6 per cent. of lime, 5 to 9 per cent. of alkalies, and smaller percentages of magnesia. They owe their name to their extensive development in the Andes of South America, though they occur extensively throughout the entire Cordilleran system of mountains, in South, Central, and North America. See RHYOLITE; TRACHYTE.

ANDI′RA (Neo-Lat., probably from the native Brazilian name). A genus of about twenty species of tropical American trees of the natural order Leguminosæ, having almost orbicular, one-celled, one-seeded pods. Andira inermis grows in low savannahs in the West Indies, and is there called cabbage tree or cabbage-bark tree. It is a tree of considerable height, having pinnate leaves, with thirteen to fifteen ovato-lanceolate leaflets and panicles of reddish lilac flowers. Its bark, called cabbage bark, or worm bark, is a powerful anthelmintic, and although it has recently been discarded from the pharmacopœias of Great Britain, still finds a place in those of other countries, along with Surinam bark, the bark of Andira retusa of Surinam. Similar properties reside in the bark of several species of the allied genus Geoffroya. A single fossil species of Andira has been described from the middle Tertiary rocks of Europe.

AND′IRON (O. F. *andier*, from Low Lat. *anderia*, a fire-dog; the Fr. *landier* stands for *l'andier*). A metal utensil used in burning wood in an open fireplace. It consists of a horizontal bar supported on three short legs with an upright standard at one end. Andirons are employed in pairs, one andiron being placed on each side of the hearth, with the uprights in front and the horizontal bars extending backward into the fireplace, the logs or sticks of wood resting across the horizontal bars. It is usual to make the uprights of various ornamental designs, and, often, to cover them with copper, brass or silver. Andirons are manufactured by forging, wrought iron being the material of which they are most commonly made. Handirons, fire-dogs and dog-irons are colloquial names for andirons.

ANDIZHAN, ăn′dē-zhăn′. Capital of the district of Andizhan, territory of Ferghana, Russian Turkestan (Map: Central Asia, Afghanistan, M 1). It is about 42 miles from Margelan, the capital of the territory, and had (1897) 46,680 inhabitants. Cotton is the principal article of commerce. In December, 1902, 1021 lives were lost in an earthquake (3342 in district). The Russians obtained possession of it in 1875.

ANDKHUI, änd-kōō′ē. A town of Afghan Turkestan, in the province of Maimene, about 200 miles south of Bokhara (Map: Central Asia, Afghanistan, K 3). It lies on the trade route between Bokhara and Afghanistan. Pop., about 15,000, housed in 2000 houses and 3000 tents.

ANDLAU, äɴ′dlō′, GASTON JOSEPH HARDOUIN, COMTE D' (1824-94). A French general, born at Nancy. He attended, for a time, the military school at St. Cyr, and later, in active service, distinguished himself as a captain in the Crimean War. At the outbreak of the Franco-Prussian War he was appointed a colonel on the general staff of the Army of the Rhine, and subsequently he fought in the battles before Metz. He was elected a senator in 1876, and promoted to be a general of brigade in 1879. He was involved in the so-called *affaire des décorations*, in which General Caffarel was found guilty of selling decorations of merit, and fled to South America. He published *De la cavalerie dans le passé et dans l'avenir* (1869) and *Organisation et tactique de l'infanterie française depuis son origine* (1872).

ANDLAW-BIRSECK, änt′läv-bēr′sĕk, FRANZ XAVIER, BARON VON (1790-1876). A German diplomat and author. He was born at Freiburg, and in early life studied jurisprudence at the university there and at Landshut and Heidelberg, and in 1824 entered the public service of Baden. From 1826 to 1830, and again from 1832 to 1835, he was secretary of the embassy at Vienna. He was appointed minister at Munich in 1838; minister at Paris in 1843, and in 1846 ambassador extraordinary at Vienna. He retired in 1856, and subsequently published *Erinnerungsblätter aus den Papieren eines Diplomaten* (1857), *Mein Tagebuch 1811-61* (1862), *Die byzantinischen Kaiser* (1865), *Sieben heilige Fürsten* (1865).

ANDOCIDES, ăn-dŏs′ĭ-dēz (Gk. *'Ανδοκίδης*, *Andokidēs*) (c. 440 B.C.). The least of the Ten Attic Orators. In 415 he was involved with the younger members of the aristocratic party in the charge of mutilating the Hermæ. To protect himself, he betrayed some of his associates, but suffered partial loss of civic rights, and went to Rhodes, where he engaged in trade. From 407 he lived in Elis. The amnesty of 403 allowed him to return to Athens. In 391 he was sent to Sparta to negotiate a peace. On his return he was unable to persuade the Athenians to accept the treaty, was charged with mismanagement, and banished. The date of his death is unknown. Three of his speeches are extant: *On His Return* (407), *On the Mysteries* (399), *On the Peace* (391). The oration *Against Alcibiades* is spurious, and the authenticity of *On the Peace* is doubted. Consult: Jebb, *Attic Orators* (London, 1876-80); Blass, *Attische Beredsamkeit* (Leipzig, 1887-98).

ANDORRA, ăn-dŏr′rȧ. A republic in the valley of the same name in the eastern Pyrenees, between the French department of Ariège and Catalonia, in Spain (Map: Spain, F 1). The valley is inclosed by mountains, through which its river, the Balira, breaks to join the Segre at Urgel. It leads a semi-independent existence under the protection of France and the Bishop of Urgel. Its area is about 175 square miles, and it is divided into six parishes. There is much excellent pasture; vines and fruit trees flourish on the lower grounds, and the mountains contain rich iron mines. The limited area of arable land makes the republic partly depend upon France for its grain. The chief industry is the production of coarse cloth, and the exports consist of wood, metal ores, cloth, and some dairy products.

Andorra was declared an independent State by Charlemagne, in reward for services rendered to him by its inhabitants when he was marching against the Moors. In 1278 Andorra was transferred to the Comte de Foix and the Bishop of Urgel, and was administered by two *viguiers* appointed by them. During the French Revolution the relations between Andorra and France were interrupted on account of the latter's refusal to accept the annual tribute, which was considered incompatible with a republican form of government. In 1806, however, the former relations were renewed, and the free importation of cereals from France was allowed in consideration of an annual tribute of 960 francs. The Republic is governed by a sovereign council of twenty-four members, chosen for a period of four years by the heads of the communities. The council is presided over by two syndics, both chosen by the members of the council, one for life and the other for a term of four years. There are two judges called *viguiers*, of whom the first, a French subject, is appointed by France, and the second, a native, by the Bishop of Urgel. There is also a civil judge, appointed by France and the Bishop of Urgel alternately. Under each *viguier* is an inferior judge called a *bailie;* there is an appeal from his judgment to the civil judge, and finally to the Court of Cassation at Paris, or to the episcopal college at Urgel. In criminal cases there is no appeal from the Court of the Republic itself, in which the first *viguier* presides. The revenue of the State is derived from lands and from some inconsiderable taxes. The Bishop of Urgel receives from the Republic an annual sum of 460 francs. The manner of life of the Andorrans is very simple. There are schools, but education is in a low state. Every able-bodied citizen of the Republic is liable to military service between the ages of sixteen and sixty. In the Carlist wars the neutrality of Andorra was strictly respected, though various complications resulted from its connection with the Bishop of Urgel. The capital, Andorra, is situated in the mountains, and has a population of about 1000. The population of the Republic is 5231. Consult: Spender, *Through the High Pyrenees* (London, 1898); Deverell, *History of the Republic of Andorra* (Bristol, 1885); Tucker, *The Valley of Andorra* (Cambridge, Mass., 1882).

ANDOVER. A municipal borough and market town in the county of Hampshire, England, 12 miles northwest of Winchester. It has manufactures of iron and farming implements. Population in 1901, 6509.

AN'DOVER. A town of Essex Co., Mass. It includes several villages, and lies south of the Merrimac. The town proper is 23 miles north of Boston, on the Boston and Maine Railroad, and on the eastern bank of the Shawsheen River (Map: Massachusetts, E 2). It produces linen twine and thread, woolen goods, rubber goods, printers' ink, and other manufactures. Andover is noted for its educational institutions, namely, the Phillips Academy for boys, founded in 1778; Andover Theological Seminary, and Abbot Academy for young ladies. It has a public library, and owns and operates its water-works. The government is administered by town meetings, annual and special, which elect as executive officers three selectmen, make appropriations, and transact other business. First settled in 1643, Andover was incorporated as a town in 1646. It was within the area especially affected by the witchcraft delusion of 1692, and three of its citizens were convicted and executed at Salem, many more being tried and acquitted. On March 5, 1698, it was attacked by Indians, who killed five of the inhabitants and burned a number of the buildings. Consult: Abbot, *History of Andover* (Andover, 1829), and Bailey, *Historical Sketches of Andover* (Boston, 1880). Population, 1890, 6142; 1900, 6813; 1906, 6632.

ANDOVER THE'OLOG'ICAL SEMINARY. One of the oldest and most famous theological schools in America, founded in 1807. Although under the control of Congregationalists, it is free to Protestants of all denominations. Applicants for the regular three years' course are required to present a college diploma. No charge is made for tuition or for room-rent in the seminary buildings. The endowment fund amounted in 1906 to about $850,000, and the value of the college property to $250,000. The library contains over 50,000 volumes. In 1906 there were five professors and four lecturers and instructors. President, Charles Orrin Day, D.D. Consult Woods, *A History of Andover* (Boston, 1884).

ANDOVER THEOL'OGY. See NEW THEOLOGY.

ANDRADA E SILVA, ȧn-drä'dȧ ĕ sĕl'vȧ, JOSÉ BONIFACIO D' (1765-1838). A Brazilian statesman and author, born at Santos. He studied in Europe, became professor of geognosy and metallurgy in the University of Coimbra, Portugal, and perpetual secretary of the Academy of Sciences at Lisbon. Having returned to Brazil in 1819, he advocated independence, and in 1822 and 1823 was Minister of the Interior under Dom Pedro I. From 1823 to 1829 he was in banishment in France by reason of his liberal views. He published *Poesias d'Americo Elyseo* (Bordeaux, 1825), and writings on mineralogy.

ANDRAL, äɴ'drȧl', GABRIEL (1797-1876). A celebrated French physician, member of the Institute, born in Paris. In 1823 he published the first volume of his *Clinique médicale.* In 1827 he was appointed professor of hygiene in the University of Paris, and in 1830 professor of internal pathology. His paper *Sur l'anatomie pathologique du tube digestif* (on the pathological anatomy of the alimentary canal) was greatly admired, and in 1829 he produced a *Précis élémentaire* on the same science. His *Clinique médicale* treats principally of diseases of the chest, of the abdomen, and of the brain. In 1839 Andral succeeded Broussais in the chair of pathology and general therapeutics. His other works include *Projet d'un essai sur la vitalité* (1835), an edition of Lænnec's *Traité de l'auscultation médiate ou traité du diagnostic des poumons et du cœur* (1836), *Cours de pathologie interne* (1836-37), *Sur le traitement de la fièvre typhoïde par les purgatifs* (1837), *Traité élémentaire de pathologie et de thérapeutique générale* (1843). His father, Guillaume Andral, was also a physician of note.

ANDRASSY, än'drä-shĭ, GYULA (Julius), COUNT (1823-90). An Hungarian statesman, born at Zemplén. He was in the Presburg Diet in 1847-48. In the revolution of 1848 he was an earnest adherent of the popular cause, and spent the years 1849-57 an exile in France and England. Returning home, he was elected a member of the Diet in 1861. After the reconstruction of Austria-Hungary on a dual basis, he became Hungarian prime minister. He succeeded Count Beust in 1871 as minister of foreign affairs of the Austro-Hungarian Empire. He was the chief representative of Austria-Hungary at the Congress of Berlin in 1878, and negotiated with Bismarck in 1879 the Austro-German alliance. He resigned in 1879. ANDRASSY, JULIUS (1860—), son of the preceding, entered the Reichstag in 1884, became secretary of state in the ministry of the interior in 1892, and in 1894-95 was Hungarian minister near the person of the King. In 1905 he was one of the leaders of the Coalition which brought about the fall of the Liberal Tisza ministry. In April, 1906, he became minister of the interior in the compromise Wekerle cabinet.

ANDRÉ, äɴ'drȧ', CHARLES (1842—). A French astronomer, born at Chauny (Aisne). In 1877 he became professor of astronomy at Lyons, and director of the observatory in that city, in which capacity he visited the Rocky Mountains and Australia to observe the transit of Venus. Among his principal works is: *L'astronomie pratique et les observations en Europe et Amérique depuis le milieu du XVIIe siècle jusqu'à nos jours* (5 volumes, 1874-78).

ANDRÉ, CHRISTIAN KARL (1763-1831). A German educator, agriculturist, and author. He was born at Hildburghausen, was an instructor at Schnepfenthal, and in 1798 became director of the Protestant school at Brünn. He was appointed manager of the estates of Prince Salm, at Brünn, in 1812, and in 1821 became secretary of the Society for the Promotion of Agriculture in Moravia. With Becker he founded the *Allgemeiner Reichsanzeiger* (Gotha, 1797). He was at different times an editor of various periodicals, and in collaboration published the series *Gemeinnützige Spaziergänge auf alle Tage im Jahr* (1790-95), and *Kompendiöse Bibliothek der gemeinnützlichen Kenntnisse* (1790-98).

ANDRÉ, ăn'drȧ *or* ăn'drĭ, JOHN (1751-80). An English soldier in the American Revolution who met his death under circumstances which have given his name a place in history. He was born in London of Genevese and French parentage, entered the English army at the age of twenty, and in 1774 joined his regiment in Canada. He was captured by General Montgomery in November, 1775, at St. Johns, and until December, 1776, when he was exchanged, he was held as a prisoner at Lancaster, Pa. He was promoted to be captain in 1777, and soon afterward became an aide to General Charles Grey. In the following year he was raised to the rank of major, and was appointed adjutant-general of the English army in America and aide to Sir Henry Clinton. During the negotiations between Clinton and General Arnold, in 1780, for the betrayal into the hands of the British of West Point, with its stores and magazines, including nearly the whole stock of powder of the American army, Major André acted as the confidential agent of General Clinton, and attended to most of the correspondence. In order to perfect plans for carrying out the plot, André, under the assumed name of "John Anderson," left New York on September 20, ascended the Hudson in the British sloop-of-war *Vulture*, and on the 21st and 22d met Arnold in secret and made the necessary arrangements. During their interview, the *Vulture* was forced down stream by the fire of an American battery, and André, armed with a pass from Arnold, and disguised (against General Clinton's explicit instructions) as a civilian, started on horseback for New York, carrying several incriminating papers, in Arnold's handwriting, concealed in his boots. Near Tarrytown at 9 A.M. on the 23d—when almost within sight of the British lines—he was captured by three American militiamen (John Paulding, David Williams, and Isaac Van Wart), who found the documents, and refusing all bribes, handed their prisoner over to Lieutenant-Colonel Jameson, by whom Arnold was blunderingly notified, and thus enabled to escape. A military court, presided over by General Nathanael Greene, and consisting of six major-generals and eight brigadiers, convened on September 29th, at Washington's request, and unanimously convicted André of being an English spy. In accordance with military usage, he was therefore condemned to be hanged, and on October 2d the sentence was carried out at Tappan, New York, André behaving with the utmost courage and serenity, and calling upon the American officers to witness that he died like a brave man. His fate aroused much sympathy everywhere, and his death has passed into history as one of the most pathetic incidents of the Revolutionary War; but it is now generally recognized both in this country and in England that Washington could not have acted otherwise than as he did, and that, by the rules of war, André clearly brought upon himself the punishment he received. A monument was erected to André's memory in Westminster Abbey, and in 1821 his body was disinterred at Tappan and conveyed to a grave near the monument.

André had a singularly attractive personality, which has added much to the general interest in his fate. Vivacious, witty, and strikingly handsome, he had, moreover, a charm of manner which made him a general favorite in the English army and endeared him even to the American officers who came in contact with him during his captivity. He was, besides, remarkably versatile, and, in particular, had considerable literary, artistic, and musical talent. A facile and pleasing writer, he carried on much of Clinton's correspondence, and wrote many fugitive verses, some of which, such as *The Cow Chase*, *Yankee Doodle's Expedition to Rhode Island*, and *The Affair between Generals Howe and Gadsden*, were very popular at the time in the English army. During the winter spent by the English in Philadelphia, he was the life and soul of all the gayeties and festivities there, and took the leading part in the famous "Mischianza" — a pageant given in honor of the departing Lord Howe. Interest in André has been much heightened, also, by the romantic story of his early attachment to a Miss Honora Sneyd, of Lichfield, England, who was subsequently married to the father of Maria Edgeworth.

In Volume VI. of the *Memoirs of the Historical Society of Pennsylvania* (1858) is the "Case of Major André, with a Review of the Statement of it in Lord Mahon's History of England," by Charles J. Biddle—an essay containing a full narrative of the case, with a discussion of all the questions of law and duty raised in connection with it. Consult also an excellent work by

Sargent, *Life and Career of Major John André* (Boston, 1861), and Lossing, *Two Spies* (New York, 1886). Many of the documents relating to André's capture, trial, and conviction are contained in H. W. Smith's *Andreana* (Philadelphia, 1865), and in Dawson, *Papers Concerning the Capture and Detention of Major John André* (Yonkers, 1866).

ANDRÉ, än'dra', LOUIS JOSEPH NICOLAS (1838—). A French general, born at Nuits-St.-Georges (Côte-d'Or). He served through the siege of Paris, in 1893 became brigadier-general and head of the École Polytechnique and in 1899 was made general of division. In May, 1900, he entered the Waldeck-Rousseau cabinet as minister of war, retaining his post under the Combes ministry. He was active in combating anti-Republican agitations in the army and resorted to a system of espionage over army officers which led to violent debates in the chamber of deputies in the fall of 1904. Following an assault at the hands of a Nationalist deputy he resigned November 14.

ANDREA, än-drā'ȧ, GIROLAMO MARQUESE D' (1812-68). An Italian cardinal. He was born at Naples, educated at the Collège La Flèche, France, and was early appointed Archbishop of Mytilene *in partibus infidelium.* In 1852 he was appointed Cardinal-abbot of Subiaco, and prefect of the Congregation of the Index, and in 1860 Bishop of Sabina. He took sides with the Patriotic Party in 1859 on the question of the national unity of Italy, and at the same time counseled extensive liberal reforms in Church policy. He was suspended from his diocese and abbacy and threatened with permanent deposition from office. He ultimately submitted, and in 1868 was rehabilitated, without, however, being restored to his diocese and the abbacy of Subiaco.

ANDREA DEL SARTO. See SARTO.

ANDREA DI UGOLINO, dē o͞o'gō-lē'nō, called **ANDREA PISANO**, pē-zä'nō (1270-c. 1349). An Italian architect and sculptor. He was the third great artist of the Pisan School, which then had the lead in Italy, succeeding Giovanni Pisano, who himself followed his father, Nicola. His greatest work is the bronze door of the baptistery of Florence, seldom equaled and never surpassed in Italian Gothic sculpture (1330). He shows the influence of Giotto in his love of allegory, his dignified compositions (contrasted with Giovanni's over-dramatic action), and his broad style. He also executed the bas-reliefs on the lower part of Giotto's campanile at Florence, and was the chief designer of the cathedral at Orvieto. He had a paramount influence on art throughout Tuscany.

ANDREÆ, än'drȧ, JAKOB, called SCHMIDTLEIN (1528-90). A German theologian. He was born at Waiblingen, March 25, 1528. He graduated at Tübingen; preached in Stuttgart and Tübingen, and was very active in promoting the Reformation throughout Württemberg, where he was court preacher. He attended the diets of Ratisbon and Frankfort (1557) and Augsburg (1559), became professor of theology in the University of Tübingen (1562), and provost of the church of St. George. He took a leading part in Protestant discussions and movements, particularly in the adoption of a common declaration of faith by the two parties, the Formula of Concord (1577). In the latter part of his life he traveled in Bohemia and Germany, working for the consolidation of the Reformation, conferring with pastors, magistrates, and princes. He was the author of more than 150 works, nearly all polemical and vigorously written, for the most part directed against Calvinism.

ANDREÆ, JOHANN VALENTIN (1586-1654). A German theologian, born at Herrenberg, near Tübingen. He studied at Tübingen, and obtained ecclesiastical preferments in the Protestant Church of his native country, and became chaplain to the court at Stuttgart, where he died. His writings are remarkable for the wit and humor, as well as for the learning, acuteness, and moral power which they display. He was erroneously regarded as the founder, or at least the restorer, of the order of the Rosicrucians (q. v.), and this opinion seemed to be supported by reference to three publications: the *Chymische Hochzeit Christiani Rosenkreuz* (1616), the *Fama fraternitatis R.C.*, i.e., *Rosaceæ Crucis* (1614), and the *Confessio fraternitatis R. C.* (1615), of the first of which he acknowledged himself the author, and the other two have so much resemblance to it as to be evidently from the same pen. His intention seems to have been not to promulgate secret societies of mystics and enthusiasts, but to ridicule the follies of the age. He attacked Rosicrucianism itself in some of his later writings. Among the best of his works are his *Menippus s. Satyricorum Dialogorum Centuria* (1617) and *Mythologia Christiana* (1619). He wrote an allegoric poem called *Die Christenburg* (Stuttgart, 1836). For his life, consult Glökler (Stuttgart, 1866).

ANDREÆ, LAURENTIUS, or LARS ANDERSSON (1480-1552). A Swedish reformer. He was born at Strengnäs, about 40 miles west of Stockholm, 1480; died there April 29, 1552. He studied at Rome, but came home a Protestant, and introduced the reformed faith into Sweden, 1523. He was made chancellor by Gustavus Vasa, who desired him to translate the Bible, in which work he was assisted by Olaus Petri (New Testament, 1526; Old Testament, 1540). After 1540 he lost the royal favor and lived in retirement.

ANDREANI, än'drȧ-ä'nē, ANDREA (c.1560-1623). An Italian engraver on wood and copper. Some of the most notable of his works are "Pharaoh's Host Destroyed in the Red Sea" (after Titian), "The Triumph of Cæsar" (after Mantegna), and "The Triumph of Christ" (after Titian). From using a similar monogram, his work has sometimes been mistaken for that of Altdorfer.

ANDREASBERG Sankt. A town of Hanover, Germany, in the Harz Mountains, about 27 miles northeast of Göttingen. It is in a rich mining district, yielding iron, copper, silver, lead, and arsenic. It lies at the south foot of the Brocken. Its fine situation and climate have made it a tourist and health resort. Population in 1900, 3846.

AN'DREAS CHES'NIUS. See DUCHESNE, ANDRÉ.

ANDREE, än'drȧ, KARL THEODOR (1808-75). A German geographer and journalist. He studied history at Jena, Göttingen, and Berlin, and from 1830 to 1855 was active in journalism. He then gave his attention to geographical and ethnological studies, publishing among other works, *Nordamerika* (second edition, 1854); *Buenos Aires und die Argentinische Republik*

(1856), and *Geographie des Welthandels* (1863-72). In 1861 he founded the *Globus*, a geographical and ethnological publication.

ANDREE, Richard (1835—). A German ethnographer and geographer, son of the preceding, born in Brunswick. He studied natural sciences at Leipzig, and from 1859 to 1863 worked as a foundryman in Bohemia, for the purpose of studying the German-Czech race conflict. He was editor of the *Globus* from 1891 to 1903. In 1902 he became professor at the University of Munich. The books embodying the results of his observations in Bohemia are written from the German nationalist point of view. They include *Nationalitätsverhältnisse und Sprachgrenze in Böhmen* (1870) and *Tschechische Gänge* (1872). His later and better-known works comprise *Zur Volkskunde der Juden* (1881), *Die Metalle bei den Naturvölkern* (1884), *Die Masken in der Völkerkunde* (1886), *Die Flutsagen* (1891), and *Braunschweiger Volkskunde* (1896).

ANDRÉE, Salomon August (1854—). A Swedish scientist and aëronaut, born at Grenna. He studied at the technical college in Stockholm, and was a member of the Swedish meteorological expedition in 1882-83. Between 1892 and 1895 he made several balloon journeys, and finally decided to attempt to reach the North Pole by means of a balloon, partly directed by sails and guide-ropes. On July 11, 1897, accompanied by two friends, Strindberg and Fränkel, he made the start from Dane Island, northwestern Spitzbergen. Four days afterward a carrier pigeon, shot on the sealer *Alken*, was found to convey in a small tube a message written by Andree two days after the ascent. The message gave the position of the party as lat. 82° 2′, long. 15° 5′ E., or 145 miles north and 45 miles east of the starting point. Of the thirteen buoys carried in the balloon, five have been discovered on coasts near Spitzbergen. Two contained dispatches, both dated July 11. The "polar buoy," which was to be cast overboard from the highest latitude attained, was found empty, at Spitzbergen, September 11, 1899. Several expeditions to Spitzbergen, Franz Josef Land, and East Greenland have failed to discover other traces of the explorer. In 1901, N. Persson, Swedish consul at Helsingfors, Russia, offered a reward for each of the eight remaining buoys that should be found before 1905; 500 kroner (about $130) for each buoy containing intelligence; 200 kroner for empty buoys or other relics of the expedition. Consult: Kullenbergh, *Andree, hans Lif och Person* (Göteborg, 1898), and *Annual Report of the Smithsonian Institution for 1898* (Washington, 1898).

ANDRE'EF, Leonid (1871—). A Russian writer born at Orel. He achieved sudden fame in 1902 on the publication of a collection of short stories which had previously appeared in various newspapers. Other collections, *The Lie* and *The Thought*, appeared within a year; *The Life of Vassili Fiweiski* (1904) is a longer tale: *Red Laughter* (1905) is a gruesome narrative of the Russo-Japanese war. He deals by preference with every-day events and characters, from which, however, he distills only pessimism and horror.

ANDREINI, än'drâ-ē'nē. A family of Italian actors and playwrights. Francesco Andreini was head of a traveling company about the end of the sixteenth century and published several plays, among them *Ragionamenti fantastici* (1612). His wife Isabella (1562-1604) was famous in Italy and France. At her death in Lyons a medal was struck in her honor bearing the words *Aeterna Fama*. Her writings include the pastoral drama *Mirtilla*, a number of lyrics and a collection of letters—Giambattista Andreini (1578-c.1650), son of the preceding, gained distinction at Paris under Louis XIII. The most noted of his works is a religious drama entitled *L'Adamo* (1613), to which it has been often said Milton owed the idea of *Paradise Lost*. His *Teatro celeste* was published at Paris in 1625.

ANDREOLI, än'drâ-ō'lê, Giorgio. An Italian ceramic painter of the early sixteenth century, born at Pavia. He had a studio at Gubbio. His majolica-ware is remarkable for its brilliant coloring and lustre. Specimens of it are in the South Kensington Museum, London.

ANDREOSSI, äN'drâ'ô'sē', Antoine François, Count (1761-1828). A French statesman, born at Castelnaudary, in Languedoc. He was the great-grandson of François Andréossi, who, with Riquet, constructed the canal of Languedoc in the seventeenth century. He entered the army as a lieutenant of artillery in 1781, joined the revolutionists, rose rapidly in military rank, served under Bonaparte in Italy and Egypt, accompanied him on his return to France, and took part in the *coup d'état* of the eighteenth Brumaire. He was ambassador at London during the Peace of Amiens, and was made governor of Vienna after the battle of Wagram. He was for some time ambassador at Constantinople, from which he was recalled by Louis XVIII. He was raised to the peerage by Napoleon after the return from Elba. After the battle of Waterloo he advocated the recall of the Bourbons, but as deputy from the department of Aude he generally sided with the opposition. He died at Montauban. He was a man of eminent scientific attainments, and distinguished himself as a member of the institute founded at Cairo. One of his first works was the *Histoire du Canal du Midi* (Paris, 1800; new edition, 2 volumes, 1804), in which he asserted the right of his great-grandfather to honors long enjoyed by Riquet. Consult Marion, *Notice nécrologique sur le Comte Andréossi* (Paris, 1846).

ANDRÉS, ȧn-drās', Juan (1740-1817). A Spanish scholar, born at Planes (Valencia). He entered the Jesuit order, and after its expulsion from Spain withdrew to Italy, where for a time he taught philosophy in the College of Ferrara. Afterward he was royal librarian at Naples. In 1815 he became blind. His works are: *Prospectus Philosophiæ Universæ Publice Disputationi Propositæ Templo Ferrariensi* (Ferrara, 1773), *Saggio della filosofia di Galileo* (1776), and *Dell' origine, dei progressi e dello stato attuale d'ogni letteratura* (Parma, 7 volumes, 1782-99).

AN'DREW (Gk. Ἀνδρέας, *Andreas*). An apostle, brother of Simon Peter, born in Bethsaida of Galilee. He was originally a disciple of John the Baptist, but was one of the first called of the disciples of Jesus, and was finally chosen by him from among his larger following to the apostolic office. (See list of apostles in Mark iii: 13-19, with Matthew and Luke parallels.) During the ministry of Jesus he figures in the feeding of the five thousand. He called attention to the lad who had the five barley loaves and the two fishes (John vi: 8), in the visit of the Greeks, with Philip, he told Jesus of the Greeks' desire to see him (John xii : 22), and in the questions put to Jesus by some of his disciples regarding the last things, with Peter, James, and John, he asked him privately: "Tell us when shall these things be?" (Mark xii: 3). There is no mention of him in the Acts of the Apostles. Subsequent tradition regarding his preaching in Scythia, Northern Greece, and Epirus, and suffering martyrdom on a cross shaped like the letter X about 70 A.D. is worthless. See Apostles.

ANDREW I. King of Hungary from 1046 to 1061, and cousin of St. Stephen, the apostle of Christianity in Hungary. He represented the party in opposition to German influence and the spread of Christianity. Andrew fought with varying fortunes against Henry III. of Germany, and against his own brother, Béla, whom he had exiled. He was finally defeated by his Polish and Hungarian opponents.

ANDREW II. (1176-1236). A king of Hungary who ascended the throne in 1205, after a civil war with his nephew, Ladislas III. In 1217 he conducted an unsuccessful crusade against the Moslem powers. In 1222 he granted the Golden Bull, called the Magna Charta of Hungary, which defined and confirmed the rights and titles of the bishops and nobles whose revolts had disturbed his reign. See Golden Bull.

ANDREW III. (?—1301). The last Hungarian King of the Árpád family, grandson of Andrew II. He was born in Venice, while his father was in exile, and succeeded Ladislas IV. in 1290. He had to defend his crown against the pretensions of Rudolph of Hapsburg and Pope Nicholas IV., both being claimants, and also against a son of the King of Naples, who claimed to be of the house of Árpád through his mother. Andrew made some efforts to develop trade, but his reign was brief and disturbed by rebellion.

ANDREW, James Osgood, D.D. (1794-1871). A Methodist bishop. He was born in Wilkes Co., Ga., May 3, 1794, became (1816) an itinerant Methodist Episcopal preacher of South Carolina Conference, until consecrated bishop at Philadelphia in May, 1832. On his relations to slavery began the first territorial cleavage of the Methodist Episcopal Church. His second wife, whom he married in 1844, was a slaveholder, and in the general conference of 1844 it was declared that "this would greatly embarrass the exercise of his office as an itinerant general superintendent, if not in some places entirely prevent it," and it was resolved "that it is the sense of this general conference that he should desist from the exercise of this office so long as this impediment remains." The Southern delegates protested that the action was extra-judicial and unconstitutional, and the difficulty was finally settled by dividing the churches and property, a Church being formed called the Methodist Episcopal Church, South. Bishop Andrew adhered to the South, and continued his episcopal work until 1868, retiring then from age. He died in Mobile, Ala., March 1, 1871.

ANDREW, John Albion, LL.D. (1818-67). An American statesman, "war Governor" of Massachusetts. He was born in Windham, Me., graduated at Bowdoin in 1837, was admitted to the Boston bar in 1840, practiced there twenty years, and took a prominent part in the cases which arose under the Fugitive Slave Law. In 1858 he was a member of the Legislature, and in 1860 was a delegate in the Republican National Convention, and was himself elected Governor of Massachusetts by the largest popular majority ever given to a candidate. He foresaw the danger of civil war and took immediate steps to perfect the organization of the militia of his State. Within a week after the first call for troops he sent forward five infantry regiments, a battalion of riflemen, and a battery of artillery. In 1861, and yearly until he insisted on retiring in 1866, he was reëlected Governor, and was probably the most efficient of all the "war Governors," continually organizing militia companies, and lending aid in every possible way to the Administration. He was at the conference of loyal Governors at Altoona, Pa., in September, 1862, and wrote the address presented by them to the President. He obtained permission from the Secretary of War in January, 1863, to organize colored troops, raised the first colored regiment (the Fifty-fourth Massachusetts Infantry) which participated in the war, and sent it to the front early in May. After the war he contended for a policy of conciliation, and vigorously opposed all measures likely to humiliate the South. In religion he was Unitarian, and presided at the first national convention of that denomination in 1865. He declined the presidency of Antioch (Ohio) College, which was offered to him in 1866. After that time he continued the practice of law in Boston. Consult Chandler, *Memoir, With Personal Reminiscences* (Boston, 1880).

ANDREW, ST., or The Thistle. See **Thistle, Order of.**

ANDREW, ST., The Russian Order of. The most distinguished order in the Russian Empire. It was founded on December 10 (N. S.), 1698, by Peter the Great, and membership in it is confined to members of the imperial family, princes, generals-in-chief, and those of similarly high rank. Grand dukes become Knights of St. Andrew at baptism, and other imperial princes upon obtaining their majority. Membership in St. Andrew's carries with it rights to the important orders of St. Anne, Alexander Nevski, and St. Stanislaus. The badge of the order of St. Andrew is a double spread eagle surmounted by the Russian crown. On the obverse of the medal is an enameled cross upon which is borne the figure of St. Andrew, and at the four corners of the cross are the letters S. A. P. R. (*Sanctus Andreas Patronus Russiæ*). On the reverse of the badge is the inscription (in Russian) "For Faith and Loyalty." See Orders.

ANDREWES, Lancelot (1555-1626). An eminent English prelate. He was born in London, September 25, 1555, and educated successively at the Coopers' Free Grammar School, Ratcliffe, Merchant Taylors' School, London, and Pembroke Hall, Cambridge, of which college, after having greatly distinguished himself by his industry and acquirements, he was in 1576 elected a fellow. On taking orders, 1580, he accompanied the Earl of Huntingdon to the North of England. His talents attracted the notice of Walsingham, Queen Elizabeth's Secretary of State, who appointed him successively, in 1589, to the vicarage of St. Giles, Cripplegate, a prebendary and canon residentiary of St. Paul's, a prebendary of the Collegiate Church of Southwell, and master of Pembroke Hall. The Queen next testified her esteem for his gifts and piety by appointing him one of her chaplains in ordinary and Dean of Westminster. He rose still higher in favor with King James, who was well qualified to appreciate his extensive learning and peculiar style of oratory. He attended the Hampton Court Conference, as one of the ecclesiastical commissioners, and took part in the translation of the Bible. The portion on which he was engaged was the first twelve books of the Old Testament. In 1605 he was consecrated Bishop of Chichester. In 1609 he was translated to the see of Ely, and appointed one of his Majesty's privy councillors both for England and Scotland. To the latter country he accompanied the King in 1617, as one of the royal instruments for persuading the Scotch of the superiority of episcopacy over presbytery. In 1619 he was translated to Winchester. He died in Winchester House, Southwark, London, on September 25, 1626. Bishop Andrewes was, with the exception of Ussher, the most learned English theologian of his time. As a preacher he was regarded by his contemporaries as unrivaled; but the excellent qualities of his discourses are apt to suffer much depreciation in modern judgment from the extremely artificial and frigid character of the style. His principal works published during his life were two treatises in reply to Cardinal Bellarmin, in defense of the right of princes over ecclesiastical assemblies. His other works consist of sermons, lectures, and manuals of devotion. Bishop Andrewes was the most eminent of that Anglican school in the seventeenth century of which the nineteenth witnessed a revival under the name of Puseyism. Its distinctive peculiarities were high views of ecclesiastical authority, and of the efficacy of sacraments, ceremonies, and apostolic succession, and extreme opposition to Puritanism. His works are in the Library of Anglo-Catholic Theology, Oxford, 1841-54, 11 volumes. Of most fame are his *Devotions* (many editions, London, 1898); *Seventeen Sermons on the Nativity* (1887). For his life, consult: Whyte (Edinburgh, 1896), and M. Wood (New York, 1898).

ANDREWS, Charles McLean (1863—). An American historian, born at Wethersfield, Conn., and educated at Trinity College. He became professor of history at Bryn Mawr College in 1889, and wrote the valuable *Historical Development of Modern Europe* (2 volumes, 1896-98), and *Contemporary Europe, Asia, and Africa, 1871-1901* (1902).

ANDREWS, Christopher Columbus (1829—). An American soldier and diplomat. He was born in Hillsboro, N. H., but lived chiefly in Minnesota after 1856. During the Civil War he rose to the regular rank of brigadier-general, and at its close was brevetted major-general. He was United States Minister to Sweden from 1869 to 1876, and United States Consul-general to Brazil from 1882 to 1885. His publications include a *History of the Campaign of Mobile* (1867), and *Brazil, Its Condition and Prospects* (1887; third edition, 1895).

ANDREWS, Edmund (1824—). An American surgeon, born at Putney, Vt. He studied medicine at the University of Michigan, where he was afterward made professor of comparative anatomy. In 1856 he removed to Chicago. He was one of the founders of the Chicago Medical College, which at present forms the medical department of the Northwestern University of Chicago. Dr. Andrews was a surgeon during the Civil War, and has been consulting surgeon to several Chicago hospitals. He has introduced a number of valuable improvements in surgery, and published a work on rectal surgery.

ANDREWS, Edward Gayer, D.D., LL.D. (1825—). An American clergyman; appointed bishop of the Methodist Episcopal Church in 1872. He was born at New Hartford, N. Y., and after graduating at Wesleyan University, Connecticut (1847), entered the Methodist Episcopal ministry (1848). He served as pastor at Brooklyn, N. Y., from 1864-72, after which he spent many years visiting foreign missions. Bishop Andrews delivered the address at the state funeral of President McKinley in Washington, September 17, 1901.

ANDREWS, Elisha Benjamin, D.D., LL.D. (1844—). An American educator, born at Hinsdale, N. H. He served in Connecticut regiments during the Civil War, losing an eye. He graduated at Brown University in 1870, and at the Newton Theological Institution in 1874. He preached for one year, and then was president of Denison University, 1875-79. He was professor of homiletics at Newton Theological Institution, 1879-82; professor of history and political economy in Brown University, 1882-88; professor of political economy and finance in Cornell University, 1888-89, and president of Brown University, 1889-98. He resigned as president of Brown in 1897 because of criticism by trustees of his advocacy of free silver, but at that time withdrew his resignation. He was superintendent of schools, Chicago, 1898-1900, and then became chancellor of the University of Nebraska. In 1892 he was a United States commissioner to the Brussels monetary conference, and was a strong supporter of international bimetallism. He has published many college text-books on history and economics; also, *An Honest Dollar* (1889), *Wealth and Moral Law* (1894), *History of the United States* (two volumes, 1894), and *The History of the Last Quarter Century in the United States, 1870-95* (1896).

ANDREWS, Ethan Allen (1787-1858). An American educator. He was born in Connecticut, and graduated at Yale in 1810. He practiced law for several years, then was professor in the University of North Carolina, after which he taught in New Haven and Boston. He published a number of Latin text-books, and in 1850 a Latin-English lexicon, based on Freund, and with Solomon Stoddard, a Latin grammar long very popular.

ANDREWS, George Leonard (1828-99). An American soldier. He was born in Bridgewater, Mass., and in 1851 graduated at West Point at the head of his class. For two years (1854-56) he was assistant professor of engineering at West Point. He then resigned from the service, and was engaged in engineering work until the beginning of the Civil War, when he entered the Union Army as lieutenant-colonel. He served in the Shenandoah Valley in 1861, took part in Pope's campaign in 1862, was raised to the rank of brigadier-general in November, 1862, and bore a prominent part in General Banks's expedition to New Orleans. He was commander of the Corps d'Afrique from 1863 to 1865, and for "faithful and meritorious services in the campaign against Mobile" was brevetted major-general of volunteers in March, 1865. He was United States marshal in Massachusetts from 1867 to 1871, and was professor of French at West Point from 1871 to 1882, and of modern languages from 1882 until his retirement in 1892.

ANDREWS, Loren (1819-61). An American educator and sixth president of Kenyon College. He was born in Ashland Co., Ohio, and was educated at Kenyon College. He took an active interest in the common schools, and it is said that much of the present excellence of the Ohio school system is due to him. His administration at Kenyon College was also very successful. At the beginning of the Civil War President Andrews raised a company in Knox County and was made captain. Afterward, as colonel of the Fourth Ohio Volunteers, he saw severe service in Virginia. He died of camp fever while in active service.

ANDREWS, Lorrin (1795-1868). An American educator. He was born in East Windsor, Conn., educated at Jefferson College, Pa., and Princeton Theological Seminary, and went as missionary to the Sandwich Islands in 1827. In 1831 he founded what became the Hawaiian University, in which he was professor. He was long privy councillor and judge under the native government. He wrote a Hawaiian dictionary, and published part of the Bible in that tongue.

ANDREWS, ST. See St. Andrews.

ANDREWS, ST. University of. See St. Andrews, University of.

ANDREWS, Samuel James (1817—). An Irvingite divine. He was born at Danbury, Conn., July 31, 1817, graduated at Williams College, 1839; practiced law for some years, but turned his attention to theology, and was a Congregational pastor from 1848 to 1855. In 1856 he became pastor of the Catholic and Apostolic Church (Irvingite) at Hartford, Conn. His publications embrace: *Life of Our Lord Upon the Earth, Considered in Its Historical, Chronological, and Geographical Relations* (New York, 1863; new and wholly revised edition, 1891); *God's Revelations of Himself to Men* (1885), *Christianity and Anti-Christianity in Their Final Conflict* (1898), *The Church and Its Organic Ministry* (1899), *William Watson Andrews: A Religious Biography* (1900).

ANDREWS, Stephen Pearl (1812-86). An eccentric writer and originator of a system of stenographic reporting. He was born in Templeton, Mass., studied for the law, and became involved in the abolition agitation, for which he undertook a mission to England. While there he learned phonography, and on his return to America devised a popular system of phonographic reporting. To further this he published a series of instruction books and edited two journals, the *Anglo-Saxon* and the *Propagandist*. He was a remarkable linguist, but an erratic scholar and writer. He devised a "scientific" language, "Alwato," in which he was wont to converse and correspond with pupils. At the time of his death he was compiling a dictionary of it, which was published posthumously.

ANDREWS, Thomas (1813-85). An Irish chemist and physicist, born at Belfast. He studied medicine and the physical sciences at Glasgow, Paris, Edinburgh, and Dublin. After practicing medicine for several years in his native city, he became, in 1845, professor of chemistry at Queen's College, which position he resigned in 1879. Andrews carried out a number of important researches on the heat developed during various chemical transformations, and on the nature of ozone. His most important contribution to science, however, was the discovery (1861) of the continuity of the liquid and gaseous states. He was the first to find that for every gas there is a temperature (called the critical temperature) above which the gas cannot be liquefied, no matter how great the pressure exerted upon it. Below that temperature the gas may be partly liquefied, gas and liquid being separated by the surface of the latter. Precisely at the critical temperature, however, the surface of separation disappears, and the substance enters into a homogeneous state, combining the properties both of the liquid and the gaseous states. This continuity of states renders it possible to extend to liquids the laws of gases, and thus establishes an intimate relationship between the properties of matter in the two states. See Critical Point.

ANDREWS, William (1848—). An English author. He was born at Kirkby-Woodhouse, England, and was educated at private academies. In 1890 he established the *Press*, one of the leading papers of Hull, which he conducted until 1900, in which year he was appointed chief librarian of the Hull Subscription Library. He is also a member of the Yorkshire Dialect Society and of the East Riding Antiquarian Society. Among his principal publications are: *Bygone England* (1892), *Literary Byways, Ecclesiastical Curiosities* (1899), *Old Church Lore* (1891), *Legal Lore* and *North Country Poets* (1888).

ANDREWS, William Draper (1818-96). An American inventor. He was born at Grafton, Mass. In 1844 he invented the centrifugal pump, which made it possible to save from abandoned wrecks goods not injured by water. This pump, patented here in 1846, was manufactured in England as the Gwynne pump. Afterward he invented and patented the anti-friction centrifugal pump, made various modifications of the centrifugal pumps, of which the "Cataract" is the most important, and patented a widely used system of gangs of tube wells.

ANDREWS, William Watson (1810-97). An American clergyman of the Catholic Apostolic Church. He was born at Windham, Windham County, Conn., graduated in 1831 at Yale, and in 1834 was ordained and installed pastor of the Congregational church at Kent, Conn. He early accepted the tenet of the Catholic Apostolic Church, commonly spoken of as the "Irvingites," and in 1849, having given up his charge at Kent, he assumed charge of the Catholic Apostolic congregation in Potsdam, N. Y. He subsequently made his home in Wethersfield, Conn., and traveled much in the Eastern and Middle States as evangelist. Among the congregations established under his direction was one organized at Hartford in 1868. He was an eloquent preacher, and a clear and forceful writer. He contributed articles on the Catholic Apostolic Church to the *Bibliotheca Sacra* and McClintock and Strong's *Cyclopædia*, prepared for the *Life of President Porter* a chapter on Dr. Porter as "A Student at Yale," and published many reviews, orations, sermons, and addresses, and *The Miscellanies and*

Correspondence of Hon. John Cotton Smith (1847). Consult Andrews, *William Watson Andrews: A Memorial* (New York, 1900).

ANDRIA, ăn'drē-ȧ. An episcopal city in south Italy, five miles from Barletta and 31 miles west of Bari, with both of which it is connected by a street railway (Map: Italy, L 6). The chief trade is in almonds, for which the country is famous, grain, cattle, and majolica. Andria was founded by the Normans, and was once a flourishing city, but war and earthquakes conspired to lay it waste. Nine miles south is the magnificent and still well-preserved Castello del Monte built by Frederick II. Pop., 1901 (commune), 49,569.

AN'DRIA. The earliest extant comedy of Terence, adapted in 166 B.C. from the *Andria* of Menander.

ANDRIEUX, äN'drē-ẽ', FRANÇOIS GUILLAUME JEAN STANISLAS (1759-1833). A French dramatist and idyllic poet, born at Strassburg. He took an active part in the Revolution, was of the Council of the Five Hundred (1798), professor in the Polytechnic School (1803), in the Collège de France (1814), member of the French Academy (1816), and its perpetual secretary (1829), collaborating actively in its *Dictionary*. He also wrote several comedies, of which the best is *Molière avec ses amis* (1804); a tragedy, *Brutus* (1794), and poems distinguished for purity of prosody and diction. Of these, *Le meunier de Sans-Souci* (1797) is still remembered.

ANDRIS'CUS (Gk. Ἀνδρίσκος, *Andriskos*). A man of low origin, who pretended to be the son of Perseus, King of Macedonia. He was seized, sent to Rome, and imprisoned; but escaping, he assumed the name of Philip, and in 149 B.C. defeated the prætor Juventius in battle. He reigned as a cruel and oppressive tyrant for about a year, but was finally conquered in 148 B.C. by Quintus Cæcilius Metellus, and again taken to Rome, where he was put to death.

AN'DROCLUS (Aulus Gellius, v: 14), or **ANDROCLES** (Ælian, vii: 48). The slave of a Roman consul of the Early Empire, who compelled him to fight with a ferocious lion in the Circus Maximus. The beast, far from hurting him, fondled him like a playful dog. The Emperor and people demanded an explanation of such strange actions, and it transpired that Androclus had escaped from a cruel master in Africa and taken refuge in a desert cave. One day, a lion entered the cave limping painfully and holding up his paw, from which Androclus extracted a large thorn. The grateful beast never forgot this, and when they met again in the fatal Circus at Rome he testified his recognition. Both slave and lion were freed, and afterward were exhibited in the streets of Rome.

ANDROGYNOUS, ăn-drŏj'ĭ-nŭs. See FLOWER, and REPRODUCTION.

ANDROMACHE, ăn-drŏm'ȧ-kē (Gk. Ἀνδρομάχη, *Andromachē*). The wife of Hector and mother of Astyanax, daughter of King Eëtion of Asiatic Thebes. Her father and seven brothers were killed by Achilles, and from that time she clung to Hector with a love whose tenderness and pathos are beautifully depicted in Homer's *Iliad*, especially in her parting with her husband (Book vi.), and her lament over his body (Book xxiv.). At the capture of Troy, her son was dashed from the walls, and she became the prize of Neoptolemus, son of Achilles, to whom she bore a son, Molossus. Afterward she was the wife of Helenus, Hector's brother, to whom she bore Cestrinus. Her danger from the jealousy of Hermione, wife of Neoptolemus, is the subject of a tragedy by Euripides. See HECTOR; TROJAN WAR.

ANDROMACHE. A tragedy by Euripides, written probably during the Peloponnesian War, as it contains many unfriendly allusions to Sparta. Its subject is the part of the legend of Andromache in which she is with Neoptolemus, her second husband.

ANDROMAQUE, äN'drō'mȧk'. (1) A tragedy by Racine (1667), founded on the classical legend. The story is adapted from Racine in Phillips's play *The Distressed Mother* (1712). (2) An opera by Grétry, presented at Paris in 1780.

ANDROM'EDA (Gk. Ἀνδρομέδη, *Andromedē*). Daughter of the Ethiopian King Cepheus and Cassiopeia. Like her mother, she was remarkably beautiful. When Cassiopeia boasted that her daughter was more beautiful than the Nereids, the latter prayed Poseidon to revenge the insult. Accordingly, the territory of Cepheus was devastated by a flood, and a sea-monster appeared, whose wrath, the oracle of Ammon declared, could be appeased only by the sacrifice of Andromeda. Andromeda was fastened to a rock near the sea, and left as a prey to the monster; but Perseus, returning from his victorious battle with Medusa, saw the beautiful victim, slew the monster, and received Andromeda as his reward. Our versions of this legend seem largely due to a tragedy by Euripides, which ended with a prophecy by Athena that all concerned should be placed among the stars.

ANDROMEDA. A genus of plants of the natural order Ericaceæ. The species, which are pretty numerous, have very much the general appearance of heaths. Most of them are small shrubs, but some of them attain a considerable size. Andromeda polifolia, a small evergreen shrub with beautiful rose-colored drooping flowers, is occasionally found in peat-bogs in different parts of Great Britain, and common throughout the north of Europe and North America. It has acrid narcotic properties, and sheep are sometimes killed by eating it. The shoots of Andromeda ovalifolia in like manner poison goats in Nepal, and similar effects are ascribed to the stagger-bush (*Andromeda mariana* or *Pieris mariana*) and other species in the United States. (See SORREL TREE.) The genus Andromeda is known in a fossil state by leaves, flowers, and fruit, referred to several extinct and to some living species, from rocks of Tertiary age in North America and Europe.

ANDROMEDA. A constellation in the Northern Hemisphere, fancied to resemble the form of a woman in chains. Its principal star is Alpheratz, of the second magnitude. Neighboring groups are Perseus, Cassiopeia, Pegasus, etc.

AN'DRONI'CUS. The name of four Byzantine emperors.—ANDRONICUS I. (1110-85) was the son of Isaac Comnenus. His life was full of vicissitudes. During part of his youth he was a prisoner of the Turks in Asia Minor. He afterward spent some time at the court of his cousin, the Emperor Manuel, and a niece of the Emperor became his mistress. He was appointed to a military command in Cilicia; but, although the favorite of the army, his imprudence and waste of time in dissolute pleasures involved him in defeat. Having engaged in a treasonable correspondence with the King of Hungary and the German Emperor, he was thrown into prison by Manuel, and remained there more than twelve years. At last he succeeded in making his escape, and reached Kiev, the residence of Prince Yaroslav. He regained the favor of his cousin by persuading the Russian Prince to join in the invasion of Hungary, but incurred his cousin's displeasure again by refusing to take the oath of allegiance to the Prince of Hungary, the intended husband of Manuel's daughter, as presumptive heir to the Empire. He was sent in honorable banishment to Cilicia, where he found a new mistress in a sister of the Empress. The resentment of the Emperor breaking out against him, he sought refuge in a pilgrimage to Jerusalem. His professions of zeal caused his former conduct to be forgotten, and he was invested with the lordship of Berytus; but his profligacy became, if possible, more scandalous than ever. He seduced Theodora, the widow of Baldwin, King of Jerusalem, who lived with him for years as his mistress. The Emperor's anger made the Syrian coast unsafe for him, and he fled with Theodora to Damascus, and finally settled down among the Turks in Asia Minor, with a band of outlaws, making frequent inroads into the Roman province of Trebizond, from which he carried away spoil and slaves. Theodora and her children were at last taken and sent to Constantinople, and thither he followed, imploring the forgiveness of the Emperor, which he obtained; but he was sent to Œnoë, in Pontus. After the death of Manuel, popular indignation was excited against the Empress, who acted as regent for her son, Alexius II., and Andronicus was recalled, in 1182, to deliver the Empire from her tyranny. He was appointed guardian of the young Emperor, and soon after his colleague in the Empire. He caused the Empress-mother to be strangled, and afterward Alexius himself, whose widow he married. His reign, though short, was vigorous, and restored prosperity to the provinces; but tyranny and murder were its characteristics in the capital. He set no bounds to the gratification of his revenge against all who had ever offended him, and his jealousy of possible rivals was equally sanguinary. At last, a destined victim, Isaac Angelus, one of his relatives, having fled to the church of St. Sophia for sanctuary, a crowd gathered, and a sudden insurrection placed Isaac on the throne, while Andronicus was put to death by the infuriated populace, after horrible mutilations and tortures, on September 12, 1185. He was the last of the Comneni that sat on the throne of Constantinople; but the succeeding dukes and emperors of Trebizond were descendants of his son, Manuel.—Andronicus II. (1260-1332), the son of Michael Palæologus, ascended the throne in 1282; but, after a weak and inglorious reign, was driven from it, in 1328, by his grandson.—Andronicus III. (1296-1341), after a reign equally inglorious, died in 1341.—Andronicus IV., as the result of a conspiracy against his father, John Palæologus, was proclaimed Emperor, 1377, but was obliged to abdicate and beg forgiveness the following year. Consult Gibbon, *Decline and Fall of the Roman Empire*.

ANDRONICUS (Gk. 'Ανδρόνικος, *Andronikos*), also called Cyrrhestes, from his birthplace, Cyrrhus, in Syria. A Greek architect, who erected the so-called Tower of the Winds at Athens, a building dating from the first century B.C. This tower was an octagonal structure, made of Pentelic marble and surmounted by a figure of Triton, which moved with the wind and pointed to the direction from which the wind came. On the eight sides of the tower were sculptured in relief figures representing the eight principal winds, and beneath these was a sundial. The interior contained a water-clock. In the Middle Ages this structure was called "The Lantern of Demosthenes."

ANDRONICUS (Gk. 'Ανδρόνικος, *Andronikos*) of Rhodes. A peripatetic philosopher, who lived at Rome in Cicero's time and employed himself in criticising and explaining the works of Aristotle (q.v.), a great number of which he was probably the means of preserving to us. None of the writings of Andronicus are extant; a work *On the Passions*, attributed to him, is a compilation of the Roman imperial period; a paraphrase of the Nicomachean Ethics is the work of Constantine Palæocappa of the sixteenth century. Consult, in general, Zeller, *Geschichte der griechischen Philosophie* (Leipzig, 1893).

ANDRONICUS, Livius. See Livius Andronicus.

ANDRONICUS, Titus. The hero of the Shakespearean play *Titus Andronicus* (q.v.).

AN'DROPO'GON (called so from the barbed male flowers, from the Gk. *ἀνήρ*, *anĕr*, man + *πώγων*, *pōgōn*, beard). A cosmopolitan genus of grasses, including about 150 species, the relative merits of which vary widely. Some are highly prized for hay and pasturage, as *Andropogon halepense*, or Johnson grass, which has been under cultivation in the United States since about 1830. It yields large quantities of hay, and in the Southern States may be cut three or four times a year. On account of its habit of growth —it spreads by its rhizomes—when once established it is difficult of eradication. It is somewhat sensitive to cold, and will not persist as a perennial except in warm regions. Recent investigations have shown that Johnson grass, if fed green, is sometimes poisonous to stock. The poisonous action is said to be due to a compound of hydrocyanic acid which disappears in ripening or drying. Other species of Andropogon are believed to possess this same property. A number of species of Andropogon are well known in the semi-arid region of the United States under the name of blue-stem grasses, and in these regions are of value. The principal of these species are: Andropogon nutans, Andropogon provincialis, and Andropogon scoparius. Other species are common in the eastern and southern parts of the United States as broom sedge; of these Andropogon virginicus is one of the most widely distributed. If cut early, the broom sedges make good hay; but if left too long, the plant becomes so woody as to be refused by all stock. In some systems of classification the sorghums are grouped under this genus. The specific name *Andropogon sorghum* and its variety, *sativus*, comprise under these classifications the saccharine and non-saccharine forms. Among the latter are durra, Millo maize, Jerusalem corn, broom corn, etc., some of which are valuable for forage in dry countries. Eight or ten species are considered of economic importance in Australia. Two tropical species are widely known, the lemon grass (*Andropogon schœnanthus*) and Andropogon nardus, sources of lemon oil and citronella oil, both of which are largely used in making perfumery.

AN'DROS (Gk. Ἄνδρος). One of the islands of the Greek Archipelago, the most northern of the Cyclades, separated from Eubœa by the Doro Channel, six miles broad (Map: Greece, F. 4). The island is 25 miles long, about nine miles in its greatest breadth, and covers a total area of about 160 square miles. The island is traversed by several mountain chains, separated from one another by deep valleys, which yield grain, olives, and other southern fruits, silk, and common vegetables. Domestic animals are raised extensively in the northern part, which is inhabited chiefly by Albanians. The chief seaports are Gavrion, Korthion and Andros, the capital. The last mentioned carries on a large trade, is the seat of Greek and Roman Catholic bishops, and has a population (1896) of 8600. The island was originally settled by pirates and subsequently by Ionians. It was successively in the hands of the Athenians, Macedonians, and Romans, and, in 1207, had a prince of its choosing, the Venetian nobleman Marino Dandolo. In 1566 it fell into the hands of the Turks, whose rule, however, was chiefly restricted to the levying of an annual tribute of 30,000 piasters. At present the island forms a part of Greece. Its population (1896) was 18,809. Consult Kopf, *Geschichte der Insel Andros* (Vienna, 1855).

ANDROS, Sir Edmund (1637-1714). A colonial governor in America, the son of an officer in the English royal household. In 1674 he was sent to America as governor of the colony of New York, and to him Sir Anthony Colve, the governor during the temporary Dutch supremacy, surrendered without forcible opposition. His commission gave him jurisdiction over Long Island, Pemaquid, and the region between the Connecticut River and the Delaware River. He was thus brought into embarrassing relations with the proprietary government of East Jersey, and also became engaged in controversies with the authorities of Connecticut. After the charters of the New England provinces had been declared forfeited by the English courts, the policy of the English administration in furtherance of a strongly centralized colonial system was illustrated by the steps taken to consolidate the lands of New England into one province, over which, in 1686, Andros was made Governor-General with large powers. He was to admit religious toleration, but could suppress all printing, name and change his council at will, and, with their consent, levy taxes, and control the militia. When Connecticut refused to recognize his authority, he appeared in the council chamber at Hartford, in October, 1687, with an armed guard, and demanded the surrender of the colony's charter. There long survived a tradition of the hiding of the charter in an oak tree. The leaders, both in Connecticut and in Rhode Island, deemed it prudent to render perfunctory obedience to the one in forcible control of the political situation. In 1688 New York and New Jersey were attached to New England, and Andros's rule was extended over all territory between the St. Croix and the Delaware. On hearing of the revolution in England, the people of Boston imprisoned Andros and some of his officers, April 18, 1689, and Leisler set up a rebel government in New York. In July Andros and a committee of accusers were ordered to England, but the charges were never pressed to a formal trial. The accession of William III. made possible the undoing of the work of Andros. The charters of Connecticut and Rhode Island were recognized as in force. Massachusetts received from the King an acceptable charter, and New Hampshire was organized as a distinct royal province. In 1692 Andros came back as Governor of Virginia, where he was popular, retiring in 1698, and acting as Governor of Guernsey, 1704-06. In 1691 he published an account of his proceedings in New England. The Prince Society has published a *Memoir*, by Whitmore (Boston, 1868-74), and an extensive series of the *Andros Tracts*, 3 volumes (Boston, 1868-74).

AN'DROSCOG'GIN. A river rising in Umbagog Lake, which lies on the State lines of New Hampshire and Maine. It is 157 miles long, and flows through both States, emptying into the estuary of the Kennebec above Bath (Map: Maine, B 7). Its value for navigation is small, but as the elevation of its source at Lake Umbagog is over 2000 feet, and as the descent is abrupt at many places, until at Auburn, Me., the elevation is but 210 feet, it affords extensive power to the many industries established on its banks.

ANDROUET DU CERCEAU, äɴ'drōō'ā' dụ sâr'sō'. A famous family of French architects of the sixteenth and seventeenth centuries, founded by Jacques Androuet (c. 1510-84), called du Cerceau from the circle used as the sign over his workshop. Jacques was one of the leaders in introducing the Italian Renaissance style into France through his works, his writings, and his numerous drawings. He was succeeded by his two sons, Baptiste (c. 1544-1602) and Jacques II. (died 1614), who took part in many of the great constructions of the time in France, such as the Louvre, the Tuileries, the Pont Neuf, St. Denis (chapel), etc. The third generation was represented by Baptiste's son, Jean (c. 1600-16), chiefly noted for the private palaces he built in Paris, such as the Sully and Bellegarde mansions.

ANDRYANE, äɴ'drē'än', Alexandre Philippe (1797-1863). A French soldier noted for his captivity in the fortress of Spielberg. He was born in Paris, and after serving as an artillery officer until 1815, went to Italy and attempted to incite an insurrection against Austria. He was arrested and condemned to death, but his sentence was commuted by the Emperor of Austria to perpetual imprisonment in the fortress of Spielberg, where for eight years he led a life of torture, vividly described in his *Mémoires d'un prisonnier d'état* (Paris, 1837-38). He was pardoned in 1832, and afterward served with the French army in Italy. After the battle of Magenta he was appointed commissary general by Napoleon III. In addition to the before mentioned work he published *Souvenirs de Genève, complément des mémoires d'un prisonnier d'état* (1839).

ANDÚJAR, ån-dōō'ʜär. A town of Andalusia, Spain, in the province of Jaen, 24 miles north-northwest of Jaen, on the right bank of the Guadalquivir, at the base of the Sierra Morena (Map: Spain, C 3). It stands on the high road at the head of a pass over the Sierra

Morena. It is quite a prosperous, modern-looking city, with fine churches, four nunneries, six monasteries for men, three hospitals, and a theatre. A fine promenade runs through the town. There is some trade in grain, cattle, and wine. Andújar is frequented for the mineral springs in its neighborhood. Pop., 1900, 16,302.

ANDVARI, änd-vä′rē. In Norse mythology, the name of the fish-shaped dwarf who owned the ring, with the curse of ill-obtained gold, fatal to the possessor. This is the key-note of the remarkable stories of Sigurd Fafnisbane and the German legends presented in musical form by Wagner in an elaborate tetralogy, consisting of *Das Rheingold* (the temptation), *Die Walküre* (Fate), *Siegfried* (the hero), and *Die Götterdämmerung* (the "Twilight of the Gods," or end of all things).

AN′ECDOTE (Gk. *ἀνέκδοτος*, *anekdotos*, **un**published, from *ἀν*, *an*, negat. + *ἐκ*, *ek*, out + *διδόναι*, *didonai*, to give). Procopius called his secret history of Justinian's court *Anecdota*. The name is applied also to portions of ancient writings long unpublished, and a number of such *Anecdota* have been collected in volumes and printed. It ordinarily means some isolated fact, usually of a personal nature, which would interest a listener. There are a great many books of anecdotes, the most celebrated in English being the *Percy Anecdotes*. See Hood, *World of Anecdote* (4 vols., Philadelphia, 1901).

ANEL′IDA AND AR′CITE. A poem by Chaucer, called also *Queen Anelida and False Arcite*. Anelida is an Armenian queen; Arcite a knight of Thebes. The work is unfinished, but was printed by Caxton. Parts of it have been recognized as taken from Statius's *Thebaid* and Boccaccio's *Teseide*. Chaucer himself acknowledged obligation to Statius and Corinna, a Greek poetess of the fifth century B.C. There is a modern version by Elizabeth Barrett Browning.

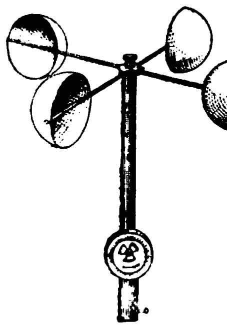
ANEM′OGRAPH (Gk. *ἄνεμος*, *anemos*, wind + *γράφειν*, *graphein*, to write, record). When a wind-vane is attached to self-recording apparatus it becomes an anemograph. Frequently the anemometer for measuring the velocity of the wind is also made to register upon the same sheet of paper and the apparatus becomes a complete anemograph. As the paper moves uniformly by clock-work, every change of the wind as to direction or velocity is registered at the proper time. The anemograph is called a wind-register in the Weather Bureau, but the word itself is retained in European literature.

AN′EMOM′ETER (Gk. *ἄνεμος*, *anemos*, wind + *μέτρον*, *metron*, measure). An instrument used to measure the velocity of the wind, its pressure, or other effects produced by it. The first instrument of this kind is commonly known as Hooke's pendulum anemometer, and is mentioned as early as 1667. It is, however, likely to have been the common product of the members of the first meteorological committee of the Royal Society of London, among whom Hooke and Sir Christopher Wren were prominent members. This form of instrument was revived in 1861 by Professor H. Wild, and is now used in Switzerland and Russia, where it is known as Wild's tablet anemometer. In this instrument a plane square tablet is suspended vertically from a horizontal axis which is kept by a wind-vane always at right angles to the direction of the wind; the tablet is raised by the wind to an inclined position of temporary rest, and its angular inclination to the vertical is noted on a graduated arc; circular plates, and especially spheres, have been sometimes used instead of the plate. About 1724 the use of a vertical pressure plate, having springs or weights at its back against which the plate is pushed by the wind, was introduced by Leupold; at the present time the pressure plate anemometer is used at a few European observatories in the form arranged by Osler for the British Association for the Advancement of Science. Theoretically, the most perfect modification of Leupold's anemometer is that devised by Jelinek in 1850, in which the springs behind the pressure plate are inclosed in a cylindrical case, which eliminates the action of the wind or the partial vacuum at the back of the plate. A third class of pressure-anemometers is that of Lind, in which the wind-pressure acts on the surface of a liquid in a U-shaped tube, raising it in one leg of the U and depressing it in the other.

Various other forms of pressure-anemometers have occasionally been used by meteorologists, but at the present time the tendency is to abandon all these in favor of instruments that rotate and give more or less correctly the velocity of the wind. This tendency is justified by the consideration that in meteorology we need only the velocity of the wind, and by the fact that, although the engineer needs to know the pressure of the wind against engineering structures, yet he cannot obtain this with sufficient accuracy from the pressures recorded by the small flat surfaces that are used in ordinary anemometers. In fact, the pressure of the wind against an obstacle depends not merely on the area of the transverse section of that obstacle, but on the shape of that section, and even still more on the longitudinal section in the direction of the wind. Thus, the pressure of the wind on wires, ropes, and rods is much greater than on globes of the same transverse section; the pressure on a triangle is greater than that on a square or circle of the same area. In general, it is more important to know the velocity of the average wind and of its maximum gusts than to know its pressure on some assumed arbitrary solid. When rain is driven with the wind, the combined pressure due to both is needed in engineering studies.

Anemometers for measuring wind velocity include both the suction-anemometers and the rotation-anemometers. In the former the open end of a long, vertical tube is freely exposed to the wind in such a way that it blows as nearly as may be transverse to the axis of the tube. The end may be fitted into the side of a horizontal contracted tube as in Venturi's instrument; or may end conically in the air, or squarely, and without any adjunct. The passage of the wind across the open end of the tube produces a diminution of barometric pressure within it, which increases with the velocity. The exact measurement of this depression gives the basis for computation of the velocity of the wind. This principle was known to the experimenters of the American Academy of Arts and Sciences (see their report for 1847), and to those of the Franklin Institute (see their report of 1842), and is that which explains the draught up a good chimney; but it was first applied to the measurement of the wind in England by Fletcher in 1867. The modifications of Fletcher's anemometer made by Hagemann, of Denmark, and by Dines, of England, appear to be especially appropriate to the measurements of gusts. The combination of suction-anemometer, pressure-anemometer, and aneroid barometer recommended by Professor Cleveland Abbe in 1882, and especially the application to the tube of parallel plates that entirely annul the wind effects seem to be essential if we would determine the true barometric pressure with a barometer exposed to the wind, as, for instance, on a mountain top.

Rotation-anemometers are those in which the wind sets in motion plane or curved metallic blades. The earliest form resembled that of Dinglinger, mentioned by Leupold in 1724, in that it used the Polish water-wheel with vertical axis, but differed essentially in that Dinglinger prevented the rotation of the arms and measured the pressure required to keep them quiet, whereas d'Ons-en-Bray, in 1734, allowed them to rotate continuously. Since that time two essentially different varieties of the rotation-anemometer have been developed, namely (a) those of Schober and Woltmann, Combes, Casella, Whewell, or Biram, in all which sets of plane plates inclined to an axis are forced to revolve about it by the wind blowing in the direction of the axis. This form is much used in studies on ventilation of mines and buildings. The most important meteorological application of this style is that manufactured by Richard for use at the French observing stations. (b) The Robinson anemometer, brought out by Dr. Robinson in 1846, but suggested to him by Edgeworth many years before. This has come into very general use by English and American meteorological observers as the Robinson hemispherical cup anemometer. In this instrument a vertical spindle carries at its upper end four horizontal arms at right angles to each other; each arm carries at its extremity a hollow hemispherical cup of thin sheet metal whose circular rim is in a vertical plane passing through the common vertical axis of rotation of the spindle. The wind rotates these cups so that the convex side of each cup goes forward. Numerous experiments have been made to determine the relation between the velocity of the wind and that of the cups. The instrument makers have generally followed Dr. Robinson's conclusion, that the linear motion of the centre of the cup is one-third of that of the wind; but observation and experiment, as well as theory, show that this cannot be true. The most intelligent and satisfactory investigation of this important subject has been carried out by Professor C. F. Marvin, of the United States Weather Bureau. Combining his results with those of European students, we must conclude that in perfectly uniform winds the general average ratio between the velocity of the wind and that of the cups varies with the length of the arm and the size of the cups between 2.5 and 3.5, so that it is necessary to determine the ratio by actual experiment upon each respective type of anemometer.

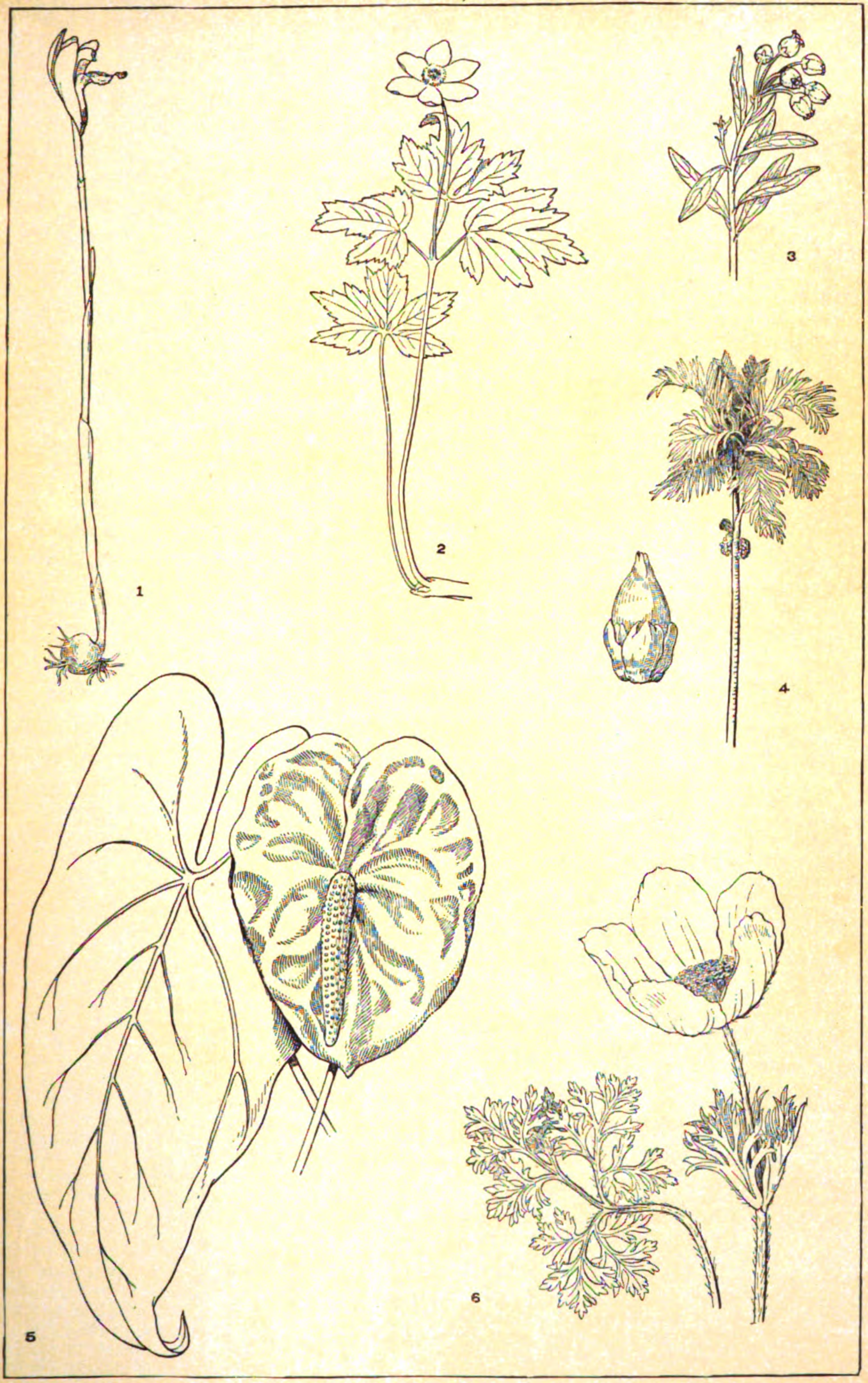

ROBINSON ANEMOMETER.

Professor Marvin shows, besides, that the ratio varies according as the anemometer is exposed to a uniform wind or to one that is variable and gusty. He finds that in the latter case the ratio depends not merely upon the dimensions of the arms and cups, but especially upon the moment of inertia of the revolving system; that is to say, on the mass of the cups. For gusty winds, the recorded wind velocity is always too great. This is explained by the fact that the gusts give to the revolving cups a great velocity, which they, by reason of their momentum, retain after the gust has ceased. It would seem, therefore, that rotating anemometers should be standardized not merely in quiet air, but also out of doors in ordinary gusty winds. By such comparisons Professor Marvin has compiled a table, of which the following is an abstract, showing the correct wind velocity for records of anemometers in the ordinary or average gustiness of the wind at Washington. If the observed wind velocities are indicated on dials constructed on the assumption that the centres of the cups move with one-third the velocity of the wind, then the corrected wind velocities are given by the following table:

Weather Bureau Anemometer. Indicated Velocity. Miles per hour.	Marvin's Equivalent. Correct Velocity. Miles per hour.	Corresponding Pressure in pounds on one square foot of area.
5	5.1	0.1
15	13.8	0.8
25	21.8	1.9
35	29.6	3.6
45	37.1	5.5
55	44.4	7.9
65	51.6	10.6
75	58.7	13.6
85	65.8	17.2

Observations on strong winds on the summit of Mount Washington indicate that the velocities given in this table apply also to that high elevation, so that there is no evidence that the Robinson anemometer is appreciably influenced by changes in the density of the air; but, of course, the wind pressures for a given velocity are smaller in proportion to the density. In order to determine the coefficient for computing wind pressure at high velocities, Marvin conducted special measurements at the summit of Mount Washington, using both large and small-pressure plates, and obtaining automatic simultaneous records on the same sheet of paper for both the pressure and the velocity. He finds that when the air has the standard density for 32° F. and 30 inches of pressure, the wind pressure on a plane flat surface is equal to 0.0040 pound to the square foot multiplied by the square of the velocity of the wind in miles per hour and by the area of the plate; this formula gives the pressures printed in the preceding table. (For further details, see Professor Marvin's paper on wind-pressures and wind-velocities, printed in the annual report of the chief signal officer of the army for 1890.) A general review of the subject of anemometry is given in Abbe's *Treatise on Meteorological Apparatus and Methods* (Washington, 1887). The Robinson anemometer, as originally made by James Green, of New York, with readings reduced

ANEMONE, ETC.



1. THE ARETHUSA (Arethusa bulbosa).
2. WIND FLOWER (Anemone nemerosa).
3. MOORWORT (Andromeda Polifolia).
4. BETEL NUT (Areca Catechu).
5. FLAMINGO FLOWER (Anthurium Andræanum).
6. POPPY ANEMONE (Anemone coronaria).

by Professor Marvin's table of wind velocities, is that adopted at all Weather Bureau stations. In order to obtain the general velocity of the wind, free from all local effects, these anemometers are, if in a city, placed as high as practicable above the roofs of tall buildings, or if located in the country, on the tallest available support. The velocities thus obtained are considerably higher than the average at the surface of the earth, but the winds at the surface are much weakened by resistances, and these higher locations are needed in order to give us a clear idea of the general motion of the air under the action of the barometric pressures indicated by the isobars.

When no anemometer is available, the pressure velocity or force of the wind is estimated and recorded on some arbitrary scale, such as that which was introduced into the British navy by Admiral Beaufort about 1800, and is almost universally used at sea. (See BEAUFORT SCALE.) The Weather Bureau has used various scales of numbers and terms, but the tendency is not to depart from the Beaufort scale. The anemometer is easily made to register its own indications on a sheet of paper, and thus becomes an anemograph. This is done mechanically in the Kew pattern used at British stations of the first order, but is done electrically at the Weather Bureau stations.

ANEMONE, *Lat.* ăn'ê-mŏ'nē; *Engl.* ȧ-nĕm'ŏ-nê (Gk. *ἀνεμώνη*, the wind-flower, from *ἄνεμος*, *anemos*, wind), or WIND-FLOWER. A genus of plants of the order Ranunculaceæ, having an involucre of three divided leaves, more or less remote from the flower; a petaloid calyx, scarcely distinguishable from the corolla, and soft, woolly achenia (see ACHENE), which in some species have tails. The name is said to be derived from the fact that many of the species prefer very exposed situations. The species number about eighty-five, and are generally beautiful. Most of them flower early in spring. They are natives of temperate and cold climates, chiefly of the northern hemisphere. One species, *Anemone quinquefolia*, the Wood Anemone, is a common native of all parts of Great Britain and eastern North America, and its white flowers, externally tinged with purple, are an ornament of many a woodland scene and mountain pasture in April and May. Another species, *Anemone pulsatilla*, or *Pulsatilla vulgaris*, the Pasque flower, adorns chalky pastures in some parts of England at the same season. Its flowers are purple and externally silky. *Anemone patens nuttaliana*, or *Pulsatilla hirsutissima*, is called the American Pasque flower, and resembles the European species. The Garden Anemone is a favorite florist's flower; the varieties are very numerous, and whole works have been published on them and their cultivation, which is most extensively carried on in Holland and has prevailed from a very early period. It is generally supposed that all these varieties have originated from two species, Anemone coronaria and Anemone hortensis, or stellata. Both are natives of the Levant; the latter is found also in Italy and the south of France. By cultivation, the size of the flower is increased, its form and colors are modified, and many of the stamens are often changed into small petals forming a doubled flower. The cultivation of the anemone requires great attention, the plant preferring light soil. The root, which consists of clustered tubers, is taken up after flowering. The plant is propagated by parting the roots or by seed. In the latter way new varieties are obtained. Seedling plants do not flower till the second or third year. Besides the species which have been named, others occasionally appear as ornaments of our flower-gardens. Anemone Apennina and Anemone pratensis have beautiful blue flowers. They are both natives of the south of Europe. Anemone Japonica, a most beautiful species, has been introduced from Japan. A number of species are common in the United States, among them Anemone quinquefolia, Anemone Caroliniana, Anemone Canadensis, and Anemone narcissiflora in mountainous regions. The species of this genus are characterized by the acridity prevalent in the natural order to which they belong, the rhizomes of Anemone nemorosa and others having been recommended in cases of obstinate rheumatism and in tænia.

ANEMONE, SEA. See SEA-ANEMONE.

AN'EMOPH'ILOUS PLANTS (Gk. *ἄνεμος*, *anemos*, wind + *φίλος*, *philos*, loving, friend). Plants whose flowers receive pollen by means of wind, in contrast with entomophilous plants, whose agents of pollination are insects. See POLLINATION.

ANEM'OSCOPE (Gk. *ἄνεμος*, *anemos*, wind + *σκοπεῖν*, *skopein*, to look at, consider). A wind-vane or other instrument which shows the direction of the wind. In its simplest and usual form it is an arrow balanced nicely on an upright rod and free to revolve. The arrow may be attached to a spindle connected with an index or compass scale, which may be either at the bottom of the vertical staff or at any convenient distance. In the wind-vane used by the United States Weather Bureau the arrow head consists of a pointer or rod about six feet in length that balances a tail-piece which is formed by two thin boards ten inches wide, joined so as to inclose an angle of about ten degrees. The wind-vane should be set up in a free and open space at a sufficient height above surrounding buildings to enable it to show the true local wind. Other forms of construction and the mechanical explanation of their action are given in Abbe's *Meteorological Apparatus and Methods* (1887); and in United States Weather Bureau *Instructions to Observers*.

A'NER. One of the three chiefs making a covenant with Abraham in Hebron (Genesis xiv : 13, 24). Like Mamre and Eschol, this eponym hero probably owes his name to that of a locality. A hill near Hebron still bears the name Ne'r. There was also a city in Manasseh named Aner (I. Chronicles vi : 70).

ANERIO, ȧ-nä'rė-ō, FELICE (1560-1630).. An Italian composer, thought to have been a pupil of Mario Nanini. In 1594 he succeeded Palestrina as composer of the Royal Chapel. Ten books of his composition were published in 1585-1622, but many unpublished manuscripts remain in the archives of the Papal Chapel. He was highly esteemed among the composers of the Italian Renaissance.

AN'EROID (containing no liquid, from Gk. *ἀ*, *a*, priv. + *νηρός*, *nēros*, liquid + *εἶδος*, *eidos*, form). A barometer first made in serviceable form by M. Vidi, of Paris, in 1848, in which the pressure of the air is measured by the change of form undergone by an exhausted metallic box under the influence of the atmospheric pressure. In the diagram, Fig. 2, *AA*, is a circular metal box which has been nearly exhausted of air and then hermetically sealed. The sides are corrugated in concentric rings, so as to increase their elasticity, and one of them is fixed to the back of the brass case which contains the whole. The amount of exhaustion is such that if the sides of the box were allowed to take their natural position they would be pressed in upon each other, and to prevent this they are kept distended, to a certain extent, by a strong spring, *S*, fixed to the case, which acts upon the head of the pillar, *B*, attached to the side next the face. When the pressure of the air increases, there being little or no air inside the box to resist it, the corrugated sides are forced inward, and when it diminishes again, their elasticity restores them to their former place, the box being extremely sensitive to the varying pressure of the external atmosphere. Supposing the two sides pressed inward, the end of the spring, *E*, will be drawn toward the back of the case, and carry with it the rod, *EG*, which is firmly fixed into it. *EG*, by the link *GH*, acts on the bent lever, *HKL*, which has its axis at *K*, so that, while the arm, *KH*, is pushed to the right, *LK* is moved downward. By this motion a watch-chain, *O*, attached at *L*, is drawn off the little drum, *M*, and the index-hand, *PP*, which is fixed to it, would move from the position represented in Fig. 1 to one toward the right. When the contrary motion takes place, a hair-spring moves tne drum and the hand in the opposite way. By this or similar mechanism a very small motion of the corrugated sides produces a large deviation of the index-hand.

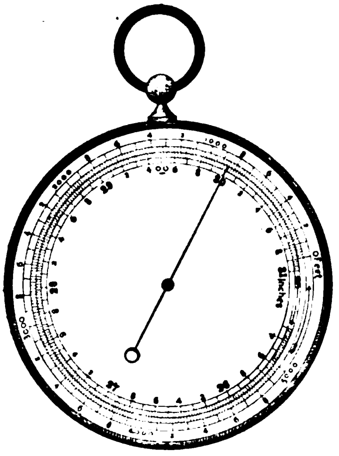


FIG. 1. ANEROID BAROMETER.

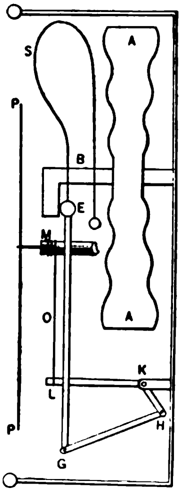


FIG. 2. CROSS-SECTION OF ANEROID.

The aneroid is graduated to represent the inches or millimeters of the mercurial barometer. It may be made to agree very closely with such an instrument, but, owing to the imperfect elasticity of the box and the steel spring, it is quite apt to disagree after a few months or years, and especially when exposed to rapid variations of pressure, being in this respect quite analogous to the ordinary thermometer, whose glass bulb has also a defective elastic reaction. Although the aneroid is very convenient, very sensitive, and unaffected by variations in gravity, yet its defects prevent it from becoming a very reliable instrument, and it must be frequently compared with the standard mercurial. It is often used in ascertaining altitude, especially by engineers and surveyors, where extreme accuracy is not required. The holosteric aneroid made by Naudet and the box-aneroid made by Goldschmid bear the highest reputation.

The Bourdon aneroid. or pressure gauge. has about the same advantages and defects as the Vidi aneroid. It consists essentially of a portion of a thin hollow ring whose section is a very flat ellipse. The ring, or curved tube, is made of elastic metal, exhausted of air and then hermetically sealed, and is, therefore, a vacuum-chamber. Changes of pressure alter the curvature of this ring, whose changes of shape are shown on a magnified scale by a delicate pointer.

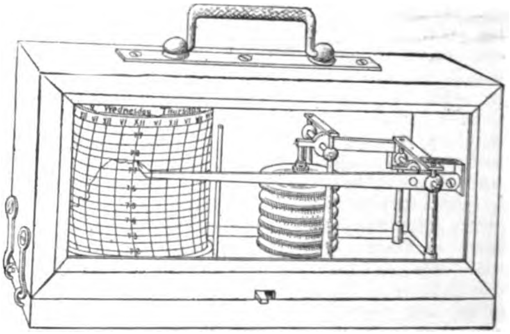


FIG. 3. BAROGRAPH, OR RECORDING ANEROID.

The aneroid barometer is also easily arranged to be self-registering, and is then known as a barograph. Instruments of this kind, made by Richard & Son, of Paris, are especially applicable for use at sea, and are also widely used at land stations. For fuller details of the construction and use of the aneroid, consult Abbe's *Treatise on Meteorological Instruments* (Washington, 1887), and the works referred to therein, or any of the larger treatises on experimental physics. See BAROMETER.

AN'EURIN. A Welsh poet, who probably lived c. 603. According to the received account, he was the son of Caw ab Geraint, the chief of the Otadini; while others have identified him with Gildas, the historian, and Mr. Stephens, the translator of his poem, makes him Gildas's son. He was present at the battle of Cattraeth as bard and taken prisoner. After his release he returned to Llancarvan, and later in life lived at Galloway. He is said to have perished at the hands of Eidyn ab Einygan. His epic poem *Gododin*, which in its present form contains over nine hundred lines, tells of the defeat of the Britons by the Saxons at Cattraeth; but the obscurity of the language has made it impossible to gain from it a clear account of the defeat, and it has even been maintained that the subject of the poem is the massacre of the Britons at Stonehenge (472). Stephens connects the event with the battle of Dagstan (603). The *Gododin* was published with an English version and notes in 1852, by Rev. J. Williams ab Ithel, and the text appears with a translation in F. Skene's *Four Ancient Books of Wales* (1866). The Cymmrodorion Society published in 1855 a new edition, with translation by Thomas Stephens. Aneurin is the reputed author of one other poem. See WELSH LANGUAGE AND LITERATURE.

AN′EURISM (Gk. *ἀνεύρυσμα*, *aneurysma*, a dilatation, from *ἀνά*, *ana*, up + *εὐρύς*, *eurys*, wide). A pulsating tumor, consisting of a sac or pouch into which blood flows through an opening in an artery. The sac of an arterial aneurism may be formed in the first instance by one or more of the tunics of the vessel, generally the outer one, the two inner having given way. This is called a true aneurism, in contradistinction to the false. The pathological condition underlying most aneurisms is a weakening of the arterial walls from disease. Thus, in the early stages of the disease of the arteries known as arterio-sclerosis, the walls of the vessels are weakened, and so less resistant. The changes in the vessel walls being uniform, the resulting aneurism is apt to consist of an even dilatation of the entire vessel, making what is called a *fusiform aneurism*. If, however, there is one particularly weak point in the coats of the artery, the distention is greatest at that point and an aneurismal sac is formed. Such an aneurism is described as a *saccular aneurism*. An aneurism may occur at a point where an artery branches, and be irregular in shape from involvement of both main trunk and one or more of the branches, *cirsoid aneurism*. Owing to injury to the internal coat of an artery, the blood may get in between the layers of the vessel walls and work its way up or down between them. This form of aneurism is called a *dissecting aneurism*. Sometimes a direct communication is found between an artery and a vein, in which case the latter, being exposed to unusual pressure, is apt to become distended and tortuous. Such a condition is called *aneurismal varix*. A *false aneurism* is one in which there is rupture of the entire wall of an artery and the blood comes in direct contact with the surrounding tissues. This is sometimes called a *diffuse aneurism*. Aneurisms prove fatal by their pressure on some important part, or by bursting and allowing a sudden escape of blood. They are cured by the deposit, within the sac, of fibrin from the blood, a result the surgeon can promote by obstructing the artery above the aneurism by compression or by ligature, applying the latter close to the sac if the aneurism is of the "false" variety, but at a distance if it is the result of disease; by inserting needles into the tumor; or by inserting and coiling silver wire within the sac and passing an electric current through it. Internal aneurisms are treated by those remedies which moderate the heart's action, as digitalis, rest, etc.

ANFOSSI, ȧn-fŏs′sê, PASQUALE (1729-97). An Italian composer. He was born at Naples, was a pupil of Sacchini and Piccini, and wrote *Il finto medico* (presented in 1764) as his first operatic composition. He was apointed chapelmaster at Venice in 1775, and directed the opera at London from 1782 to 1787. Subsequently he was choirmaster in the church of St. John Lateran, Rome. Of his numerous operas, which are marked rather by skillful arrangement than by much originality, the best known were *L'avaro*, *Il curioso indiscreto*, and *I viaggiatori felici*. His sacred compositions are considered less important.

ANGARA, än′gȧ-rä′. A river in Siberia, the most important affluent of the Yenisei on its right (Map: Asia, J 3). Properly speaking, there are two rivers by that name: the Upper Angara, rising among the ridges of the Olekma and Vitim Mountains, in lat. 57° N. and long. 114° 56′ E., and emptying into the northern end of Lake Baikal; and the Lower Angara, an outlet of the lake, whence it issues as a stream of clear, transparent water, flowing by the city of Irkutsk toward the north, then to the west, for a distance of about 1300 miles. The river is about 9000 feet wide at its broadest part, and 1600 feet at its narrowest. It is of sufficient depth for navigation, but has numerous rapids in the middle of its course. Works for the improvement of navigation have been started by the combined efforts of the Government and private persons. It is proposed to clear the stream of its submerged rocks and to dig a canal about two miles long to circumvent the Paduna, the most dangerous rapids on the stream, and a continuous waterway will thus be formed between the lake of Baikal and the Yenisei River. Into the Angara fall numerous considerable tributaries—the largest of which are Irkut, Kitai, Bielaya, Oka, and Tasserva on the left, and Kunda, Yanda, Ilim, and Tchadobetz on the right. It was discovered by the Cossack traders early in the seventeenth century; in 1645, Kolenikoff ascended it as far as the lake of Baikal. The Lower Angara is also called Upper Tunguska.

AN′GEL. An antiquated English gold coin, varying in value from $1.60 to $2.50. It was so called from the figure upon its obverse of the Archangel Michael piercing the dragon. Angels were coined from Edward IV. to Charles I.

ANGEL (Gk. *ἄγγελος*, *angelos*, messenger). The English word denotes a superhuman being intermediate between God and man. But the original meaning was simply that of a "messenger," either human or superhuman. It is doubtful whether the word was used at all in pre-exilic times as a designation of a being greater than man. In Genesis vi : 2, the term "sons of God" was rendered "angels" by the Greek version; in earlier days they were no doubt regarded as divine beings. The "angel of Yahweh" is thought by many scholars to be a manifestation of this deity, and it was probably so understood in antiquity; but the "angel" is likely to have been brought into the text as a substitute for Yahweh himself, appearing in the original form of the narrative. In Jacob's vision the "angels" seem also to have been originally "gods" or "sons of gods." As long as Yahweh manifested himself in human shape, he had no need of a messenger. There were beside him "gods many and lords many" with their habitat in the sky or on the earth, in trees and fountains and stones, by the hearth and in the tomb; but they were not messengers. Some of them appear to have been associated with Yahweh as his council or retinue. In the story of the Garden of Eden, Yahweh says: "Man has become like one of us." Possibly the title "Yahweh of hosts" refers to armies of such spirits. But they were simply called *Elohim*, or "sons of gods," not "angels."

It was the growth of monotheism that forced reflection upon the character of these superhuman beings. The second Isaiah looked upon the gods of the nations as mere lifeless statues. This view could not gain permanent ascendency. It was too superficial. Only the subordination of all spirits to Yahweh was essential. The gods of the peoples ceased to be independent rulers and became Yahweh's servants, henceforth to do his bidding in connection with the natural forces and elements with which they had been previously associated, or as guardians of the nations they had once governed. In Daniel the celestial princes of Persia and Greece are mentioned. The sons of the gods have become angels in the prologue to Job. An increasing emphasis on the divine transcendence caused a reluctance to ascribe to him certain activities. He no longer reveals himself directly, but through an angel, to his prophets; he does not fight his people's battles, but his chief angel stands up for Israel; he no longer tempts to evil or inflicts it himself, but allows an angel, the Satan, to do this. Angels receive individual names, Michael, Gabriel, Raphael, Uriel. Under the influence of Persian thought the conception of seven archangels is introduced, corresponding to the seven *amesha spentas*, and these angels are spoken of as "watchers." The idea of a fall of angels is not found in the Hebrew Bible, but is distinctly taught in the Book of Enoch.

Jesus in his discourses mentions angels, and, indeed, represents each human being as having a celestial patron (Matthew xviii : 10) ; pictures the angels as rejoicing over the repentance of sinners (Luke xv : 10), and states that those who are permitted to share in the resurrection will be like angels, having no conjugal relations (Matthew xxii: 30). The Evangelists expected his return upon the clouds of heaven as the Messiah accompanied by his holy angels. In the Apocalypse angels figure prominently. They also occur frequently in Paul's writings. Angels are said to be created (Colossians i : 16), and should not be worshiped (Colossians ii : 18) ; they were the agencies through which the law was given (Galatians iii : 19) ; on account of their sensibility to female beauty women should wear veils (I. Corinthians xi : 10) ; they are powerful beings, "thrones" and "principalities," and men should not turn away from Christ to these "elementary spirits of the world" (Galatians iv : 3).

In the Christian Church the belief in angels has continued until the present time, though gradually losing its intensity through the accession of martyrs and saints to the class of intermediaries between God and man, and in more recent times through the spread of rationalistic tendencies of thought. An excellent summary of our present knowledge of Jewish angelology is found in Dr. K. Kohler's article on this subject in *The Jewish Encyclopædia;* the relations to Babylonian thought are well treated in R. Stübe's *Jüdisch-Babylonische Zaubertexte* (Halle, 1895), and the relations to Mazdaism in Nathan Söderblom's *La vie future dans le Mazdéisme* (Paris, 1901).

The creation of the angels was placed, by the Platonizing Church Fathers, before that of the material world; others assigned to it some one of the six days. Equally various were the opinions as to the nature of the angels. The second Synod of Nice (787) assigned them a subtle, ethereal, or fire-like body; the scholastics, on the other hand, and the Lateran Council of 1215, maintained their immateriality; while others, owing to the appearing of angels, mentioned in Scripture, attributed to them the power of assuming momentarily the corporeal form.

Some of the Fathers also spoke of good and bad guardian angels, the former of whom were always ready to prompt to good actions, and to avert evil, while the latter were equally quick in bringing about mischief, wickedness, and calamity. From the belief in the guardianship of angels, and their participation in the government of the world, arose naturally the practice of invoking and worshiping them. Many Christian teachers condemned it, appealing to Colossians ii : 18; and the Council of Laodicea (300) called it disguised idolatry. But after the Council of Nice had conceded that, though angels were not to receive divine worship, they might receive reverential obeisance, the practice mentioned became more and more rooted, and continues in the Greek and Roman Catholic Churches to this day.

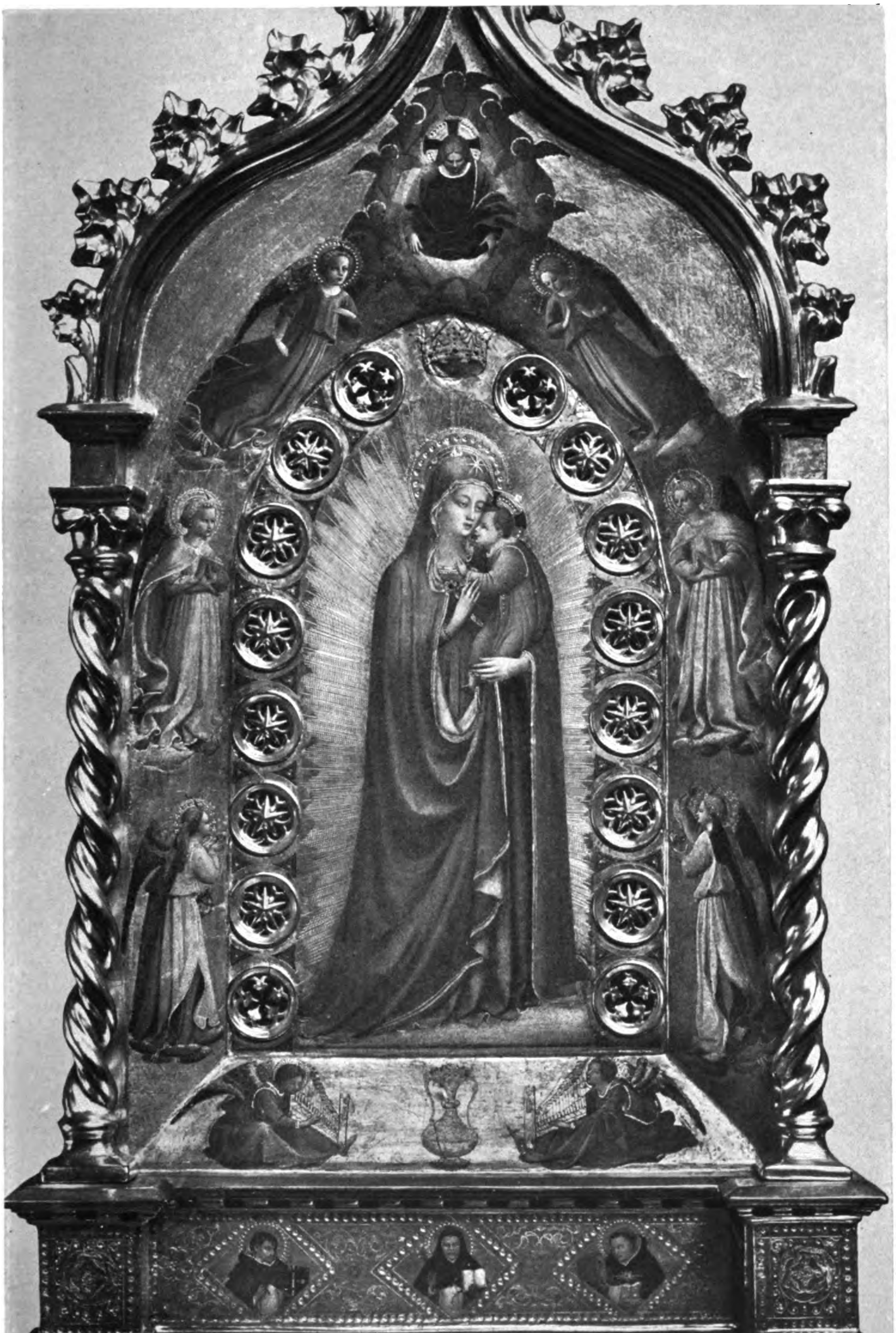
ANGEL, BENJAMIN FRANKLIN (1815-94). An American diplomat, born at Burlington, N. Y. He studied law and was admitted to the bar, and served as surrogate in 1838-41 and 1844-47. He was sent as United States consul to Honolulu in 1853. The same year he was special commissioner to China for the settlement of differences between the Chinese Government and American merchants with regard to the levying of export duties. He was minister to Sweden and Norway in 1857-62.

AN′GELA MERICI, mȧ-rē′chė, SAINT (1470-1540). Founder of the Roman Catholic order of Ursulines (q.v.). She was born at Desenzano, near Brescia, was of the Franciscan tertiaries when she founded in Brescia the order in 1535, and died there, January 27, 1540. See her life by Sintzel (Regensburg, 1842), and by J. A. At (Notre Dame d'Alet, 1885).

AN′GEL FISH (Alluding to its large, wing-like fins), or ANGEL SHARK, or MONK FISH. An elasmobranch (*Squatina angelus*) very closely related to the shark, with a broad and flattened body and with the much enlarged pectoral fins expanded laterally like wings. It attains a size of three to four feet, and is harmless. It is found in tropical seas, is common in the Mediterranean, and also occurs upon both the eastern and western shores of the warmer parts of North America, keeping near the bottom and being nowhere numerous. It is also known to American fishermen as "monk fish."

Another angel fish in the United States is one of the porgies (*Chætodipterus faber*). See PORGY.

In Bermuda the name is applied to chætodonts of the genus Holacanthus, and especially to the widely distributed emperor fish (*Holacanthus ciliaris*). Goode says that it attains a weight of four pounds and "far surpasses all the other fishes of the region in the delicious flavor, and in its lovely hues." A second species is the black angel fish (*Holacanthus tricolor*), which, like the other, is common throughout West Indian waters. See CORAL FISH, and plate of CORAL FISHES.



FRA ANGELICO

MADONNA OF THE STAR, IN THE CONVENT OF SAN MARCO, FLORENCE

ANGELI, än′gĕ-lï, Heinrich von (1840—). A painter of historical pictures and portraits, born at Ödenburg, Hungary. He studied with Leutze at Düsseldorf, where he painted the famous picture, "Mary Stuart at the Reading of the Death Warrant" (1857). In 1862 he made his home in Vienna, where he soon won recognition as a painter of portraits, particularly those of the royalty. Some of the best of his portraits are those of the Crown Prince Frederick William (1874), Field Marshal von Moltke (Museum of Breslau, 1884), "Queen Victoria Seated on the Throne" (1885), "Emperor William II. in the Uniform of a General" (1888).

ANGEL′ICA (Lat. angelic, i.e., plant or herb, in allusion to its medicinal qualities). A genus of plants of the natural order Umbelliferæ, by some botanists divided into two, Angelica and Archangelica. The species are mostly herbaceous and perennial, natives of the temperate and colder regions of the northern hemisphere. They have bipinnate or tripinnate leaves. Wild angelica (*Angelica sylvestris*) is a common plant in moist meadows, by the sides of brooks, and in woods throughout many parts of Europe and Asia. The root is perennial, short, ringed, and branched; it is white within, and contains a yellow, milky juice. The stem is hollow, 1½ to 5 feet high, often flecked with red; the umbel is convex. Garden angelica (*Archangelica officinalis*) is a biennial plant, becoming perennial when not allowed to ripen its seeds. It has greenish flowers in almost spherical umbels. The stem is as high as a man. The fruit is long and straw-colored. The root is long and fusiform, an inch or more in thickness, with thick, irregular rugose rootlets. The whole plant, and especially the root, is aromatic and bitter, containing much resin and essential oil. The root has been admitted into the pharmacopœias as an aromatic stimulant and tonic, and used in nervous ailments, and in indigestion and flatulence. It is very little used. The root of Angelica sylvestris is sometimes substituted for it, but is much weaker. The garden angelica was at one time much cultivated for the blanched stalks, which were used as celery now is; but its cultivation for this purpose has been almost entirely discontinued. The tender stalks and midribs of the leaves, candied, are still, however, a well-known article of confectionery and an agreeable stomachic; the roots and seeds are employed in the preparation of gin and of "bitters." The plant is a very doubtful native of Great Britain, but is common in many parts of Europe, and even in Lapland and Iceland. The Laplanders not only use it as food, but regard the stalks roasted in hot ashes as an efficacious remedy in pectoral disorders. The powdered seeds of the wild angelica are used by the country people in some parts of Europe to kill lice. Several species of Angelica are natives of North America, Angelica hirsuta and Angelica atropurpurea being the best known in the eastern United States. They are perhaps without any important economic value.

ANGEL′ICA. (1.) In Boiardo's *Orlando Innamorato* and Ariosto's *Orlando Furioso*, a beautiful and faithless Oriental princess, the mischief-maker who beguiles Orlando. She is noted for her magic ring, which had the power of making its wearer invisible. (2.) In Congreve's *Love for Love*, an attractive heiress. (3.) A character in Farquhar's *The Constant Couple* and *Sir Harry Wildair.*

ANGELICA TREE. See Aralia.

ANGEL′IC DOCTOR, The (Lat. *Doctor Angelicus*). Thomas Aquinas, so called by his admirers; known also as "The Angel of the Schools."

ANGELIC HYMN. Another name for the *Gloria in Excelsis* (q.v.).

ANGEL′ICO, Fra (1387-1455). The name applied to Guido di Pietro da Mugello, also known as Fra Giovanni da Fiesole. He was born at Vicchio (Mugello), and entered the Dominican order at San Domenico near Fiesole in 1407. Because they sided with Gregory XII. in the papal schism, the community went to Foligno and then to Cortona. Returning to Fiesole in 1418, they removed in 1436 to the convent of San Marco in Florence. Angelico was employed in decorating the walls of this convent until about 1445, when he was summoned to Rome by Pope Eugenius IV. Except for a short stay in Cortona, he remained in Rome until his death. His master in painting is not known. He began as a miniaturist and later was influenced by Masaccio. His earliest works are at Cortona and in the Florentine Academy. Among the principal paintings of his best period is his "Last Judgment" (Florentine Academy), in which the representation of Paradise is particularly delectable. Others are the "Coronation of the Virgin" (Florentine Academy), a larger representation of the same subject in the Louvre, and the celebrated Madonna surrounded by saints and the angels (Uffizi). The convent of San Marco is a veritable museum of his frescoes. The cloister is decorated with representations of great Dominicans. The chapter-house has a large "Crucifixion," and in forty-three rooms of the upper floor are frescoes from the life of Christ. His principal works at Rome are the decorations of the chapel of Nicholas V. in the Vatican, from the life of Saints Stephen and Lawrence, which show the influence of the new realistic school. He is the last and greatest of the painters of the transitional period from the Middle Ages to the Renaissance. His ideas are mediæval, but his methods of expression are modern. Although he had no knowledge of the nude, and was unable to render dramatic action, his paintings are effective through the wonderful expression of the faces, and the beauty of color and arrangement. No painter has succeeded better in expressing fervid religious sentiment. "Surely," says Michelangelo, "the good brother visited Paradise, and was allowed to choose his models there." Consult the biographies by Cartier (Paris, 1857), Förster (Regensburg, 1859), Goodwin (London, 1861), Phillimore (ib. 1881), Ley (ib. 1886), Beissel (Freiburg, 1895), Supino (Florence, 1898), and Douglas (London, 1900), and the monograph of Rothes (Strassburg, 1902).

ANGELIC SALUTATION. See Ave Maria.

AN′GELI′NA. (1.) In *The Rival Ladies*, by Dryden, a sister of Don Rhodorigo. (2.) In Goldsmith's ballad of "Edwin and Angelina" in *The Vicar of Wakefield*, the heroine. (3.) A pseudonym used by Harriet Martineau.

ANGÉLIQUE, àɴ′zhȧ′lēk′. (1.) In Molière's *Le malade imaginaire* (q.v.), the daughter of the "invalid" Argan. (2.) In Molière's *Georges Dandin* (q.v.), the aristocratic wife of the rich peasant who is the principal character.

ANGELL, ăn′jĕl, George Thorndike (1820—). An American philanthropist. He was born at

Southbridge, Mass., and was educated at Brown University and at Dartmouth College. In 1868, with several other influential persons, he founded the Massachusetts Society for the Prevention of Cruelty to Animals, of which association he was later elected president. In the same year he established the publication entitled *Our Dumb Animals*, the first periodical of its kind. During a visit to England in 1869 he urged the Royal Society to publish the *Animal World*, and induced the Baroness Burdett-Coutts to organize the Ladies' Humane Educational Committee of England; and he has been instrumental in the formation of many similar societies throughout the United States. In 1889 he was empowered by the Massachusetts Legislature to incorporate the American Humane Education Society. Mr. Angell has also been instrumental in establishing several public health associations, and in promoting the movement directed against the sale of poisonous and adulterated foods. Many of his publications have been translated into foreign languages. One of his more recent productions is the entertaining volume entitled *Autobiographical Sketches and Personal Recollections* (Boston, 1891).

ANGELL, JAMES BURRILL, LL.D. (1829—). An American educator and diplomat. He was born in Scituate, R. I., graduated at Brown University in 1849, and after travel in the South and in Europe became, in 1853, professor of modern languages and literature in Brown University. He was the editor of the Providence *Daily Journal* from 1860 to 1866, when he was appointed to the presidency of the University of Vermont. In 1871 he became president of the University of Michigan, which under his continued administration has come to be one of the foremost universities in the country. He was United States minister to China from 1880 to 1881, at the same time acting as one of three commissioners to negotiate a new treaty with that government. Dr. Angell was a member of the Anglo-American International Commission on Canadian Fisheries in 1887, and in 1896 he was chairman of the Canadian-American commission on a deep waterway from the great lakes to the sea. He was appointed Minister to Turkey in 1897, but resigned in May, 1898. In 1887 he became a regent of the Smithsonian Institution. Besides numerous addresses and frequent contributions to magazines, President Angell has published text-books, such as *Progress in International Law* (1875), and he wrote the article on "The Diplomacy of the United States" for the *Narrative and Critical History of America* (1888).

ANGELL, JOSEPH KINNICUT (1794-1857). An American lawyer. He was born in Providence, R. I., and graduated at Brown University in 1813. He published a *Treatise on the Common Law in Relation to Water Courses*, with an appendix (fifth edition, Boston, 1850); *A Practical Summary of the Law of Assignments* (Boston, 1835), and other valuable treatises on legal subjects, and edited the *United States Law Intelligencer and Review* (1829-31).

ANGELO, MICHAEL. See MICHELANGELO.

AN'GELO. (1.) In Shakespeare's *Measure for Measure*, the duke's hypocritical deputy. The duke frustrates his evil designs, compelling him to give up Isabella and marry Mariana, whom he has deserted. (2.) A character in Shakespeare's *Comedy of Errors*.

ANGELO, TYRAN DE PADOUE. A drama in prose by Victor Hugo, produced by the Comédie Française, April 28, 1835. It was produced later in London (translated by G. H. Davidson) as *Angelo and the Actress of Padua*. The period of the action is the sixteenth century.

ANGEL OF THE CHURCH. The term applied in Revelation to each of the recipients of the Saviour's messages to the Seven Churches of Asia. It is perhaps best to understand it as meaning the presiding officer of the Church, who would naturally be the one to whom a message would be sent, and who may fairly be considered representative of the churches (cf. Rev. i. 20). See CHURCHES OF ASIA, THE SEVEN.

AN'GELUS, THE. A well-known painting by J. F. Millet (1859). It represents two French peasants stopped in their field work for a moment of prayer at dusk by the Angelus bell, which the artist has suggested by the church spire in the distance. It was sold by the artist for a small sum, but in 1889 was bought by the American Art Association for more than 580,000 francs, and exhibited in this country. The next year M. Chauchard bought it for $150,000; it is understood that it will ultimately find a place in the Louvre.

ANGELUS BELL, THE. A bell rung in all Catholic countries morning, noon, and night to invite the faithful to the recitation of the angelic salutation. Formerly the hours for the ringing of the Angelus were at sunrise, noon, and sunset, but it is now more generally heard at the appointed hours of noon, and six o'clock both morning and evening. The bell receives its name from the title given the prayer recited at this time, *Angelus Domini*, also called *Ave Maria* (q.v.).

ANGELUS DOM'INI (Lat. The Angel of the Lord). The name of a brief prayer repeated by Roman Catholics at the sound of the Angelus bell, at sunrise, noon, and sunset.

ANGELUS SILE'SIUS, JOHANN SCHEFFLER (1624-77). A German poet. He was born in Breslau, studied medicine at Strassburg and Padua, and in 1653 entered the Catholic Church. In 1661 he joined the Minorites and was ordained priest. His earlier writings include a number of pronouncedly mystical poems, such as the *Cherubinischer Wandersmann* (1657), a profound and pantheistic description of the way to God. Subsequently he became a fanatical controversialist. He wrote some stirring hymns, of which many found their way into Protestant hymnals. There is an edition of his works, by Rosenthal, in two volumes (1862). Consult also: Schrader, *Angelus Silesius und seine Mystik* (1853); Kahlert, *Angelus Silesius: Eine litterarhistorische Untersuchung* (1853); and the biography by C. Seltmann (Breslau, 1896).

ANGELY, äɴ'zh'lĕ', LOUIS (c. 1788-1835). A German actor and dramatist. He was born in Berlin, and began his career as an actor early in life. He was at first a comedian at the German theatre at St. Petersburg, and in 1828 went to Berlin, where for two years he was an actor, and afterward skillfully adapted French plays to German conditions. Among his best productions are *Paris in Pommern*, *Die Hasen in der Hasenheide*, *Wohnungen zu vermieten*, *Sieben Mädchen in Uniform* (very successful), *Von Sieben die Hässlichste*, and *Das Fest der Handwerker*. His plays have been collected and published under the titles of *Vaudevilles und Lustspiele* (4 volumes, Berlin, 1828-42), and *Neuestes Komisches Theatre*, 3 volumes (Hamburg, 1836-41).

AN'GER (Icel. *angr*, grief, straits; O. H. G. *angust;* Ger. *Angst*, anxiety; Lat. *angor*, a choking, strangling, anguish, from the root *ang*, seen in Lat. *angustus*, narrow, close; Gk. *ἀνχι*, *anchi*, near; Ger. *eng*, narrow, close; A. S. *ange*, *onge*, narrow, strait, troubled). An emotion (q.v.) characterized by a peculiar, aggressive attitude toward its object (usually a person) and by the large number of expressive bodily movements which accompany it. Bain finds the essential element in anger to be "an impulse knowingly to inflict suffering upon another sentient being, and to derive a positive gratification therefrom." This impulse is usually connected, at least in the experience of the human adult, with a vivid consciousness of self and the sense of injury to person or property. There are several varieties of anger, differing in the motives which introduce them, the pleasantness or unpleasantness of the motive consciousness, and the avenues of activity through which the emotion works itself out. Language bears witness to the great number of shades of anger in the words *rage*, *ire*, *fury*, *wrath*, *temper*, *gall*, *frenzy*, and in a host of descriptive adjectives, such as *bitter*, *defiant*, *frantic*, *demoniacal*, *hot*, *indignant*, *violent*, *vicious*, *furious*, *malignant*, *raving*, *resentful*, *mad*, *volcanic*.

The anger known as "righteous indignation" is aroused by strong ethical motives. The angry individual is persuaded that a wrong has been done himself, or some object, or another person. This is a resentful anger, and includes a moral judgment of condemnation. The emotion is pleasant (except where it is introduced by too great a shock, or where the consciousness of moral obliquity counteracts the pleasantness) and develops by an expansion—both mental and physical—of the individual. As the agent of justice, the angered person acquires an amount of self-esteem, which is reflected in a tendency to muscular activity, deepened respiration, and aggressive postures. On the other hand, when anger is complicated by the emotions of fear, hatred, envy, or jealousy, or when it is baffled, it acquires a different character. It then becomes unpleasantly toned, is accompanied by choking and stuffiness, trembling and weakness, and a loss of muscular force. But even in anger which is intrinsically unpleasant, a successful termination of the attempt to injure the object of the emotion brings a moment of satisfaction and pleasure, as in the humiliation of a rival.

The most common bodily accompaniments of anger are vaso-motor disturbances (most easily seen in flushing and pallor), glandular secretion (such as tears and saliva), modifications of respiration, and involuntary movements. Other more or less specific bodily signs are screaming, crying, threatening articulations, trembling, stamping, facial contortions, scratching, striking. The coarser bodily expressions of anger are more moderate in the adult and the cultured than in the child and primitive man. The efforts of society to secure justice and well-being for the individual destroy many of the sanctions for anger and also control its manifestations. Doubtless the value of anger in the history of the race has been great. It has prevented the encroachments upon the individual which tend toward extermination. Consult A. Bain, *The Emotions and the Will* (London, 1880).

ANG'ERBO'DA. In Norse mythology, a giantess, mother of Fenrir (q.v.).

ÅNGERMANELF, ŏng'ẽr-mȧn-ĕlf'. A river in Sweden, rising on its western boundary (Map: Sweden, G 5). After passing numerous lakes, it enters the Gulf of Bothnia by a large estuary, above Hernösand. It is about 150 miles long, navigable for 75 miles, and celebrated for the beautiful scenery of its banks.

ÅNGERMANLAND. A former division of Sweden, now chiefly comprised in the län of Vesternorrland. It extends along the Gulf of Bothnia and is watered by the River Ångermann. The district exhibits great variety of wild and beautiful landscape—wood, mount, stream, and lake. It is under a high state of cultivation, producing barley, rye, and pease, and abounding in excellent pasturage. The inhabitants are favorably known for their sobriety, industrious habits, and general prosperity. The chief town, Hernösand, with a population (1900) of 7890, stands on the small island of Hernö, and has weekly steam communication with Stockholm. It is the seat of a bishop. It has a literary and printing establishment with Lappish type. There are public baths and graving docks. It exports linen fabrics, and the Baltic products generally.

ANGERMÜNDE, äng'ẽr-mụn'd*e*. A garrison town and railway junction, capital of a circle of the same name in the province of Brandenburg, Prussia, 45 miles northeast of Berlin by rail. It has manufactures of woolen and linen goods. Its principal public building is St. Mary's Church, a lofty Gothic structure of the thirteenth century. Pop., 1895, 7334; 1905, 7589.

AN'GERO'NA. An early Roman divinity in some way connected with silence and always represented with her finger on her lips or the mouth bound with a fillet. Her festival, which was celebrated on the 21st of December, would seem to indicate some relationship with the winter solstice. Later she took on the nature of a goddess of sorrow and disease.

ANGERS, äɴ'zhā' (the ancient *Andes*, capital of a Gallic tribe, known under the Lat. form *Andecavi*). Formerly the capital of the Duchy of Anjou, and now of the French Department of Maine-et-Loire, situated on both sides of the navigable river Mayenne, not far from the junction of the Sarthe with it, and about five miles from its confluence with the Loire (Map: France, F 4). Old Angers, "The Black City," is fast disappearing, and a new, bright town taking its place. The ancient walls are changed into shady boulevards; new-fashioned buildings and bridges are appearing. The cathedral of St. Maurice is one of the oldest surviving structures, and is a fine specimen of thirteenth century Gothic. The castle of Philip Augustus still stands, with its round towers. Angers is the see of a bishop. It has also a Catholic school, with faculties of law, mathematics, science, and philosophy, a school of art, a theological seminary, an institution for the deaf and dumb, a botanical garden, a large picture gallery, and a public library. The ruins of the ancient castle of Angers, built by St. Louis about the middle of the thirteenth century, are situated on a projecting rock above the river. Sail-making, cotton-spinning, stocking-weaving, etc., are carried on to a considerable extent, and a trade in corn, wine, brandy, flax, hemp, honey, etc. There are slate quarries in the neighborhood. Angers is the birthplace of René of Anjou, the learned Ménage, the publicist J. Bodin, and the sculptor David, whose statue was unveiled in the Place de Lorraine, October 24, 1880. Pop. in 1901, 82,398. Consult A. Debidour, *La Fronde angevine; la vie municipale au 17e siècle* (Paris, 1877).

AN'GEVIN LINE, or **DY'NASTY**. The English kings from Henry II. to John, since their family, the Plantagenets, came from Anjou in France.

ANGHIERA, ân-gyā'râ or **ANGHERA**, ân-gā'râ, Pietro Martire de. See Peter Martyr.

AN'GILBERT, Saint (c. 740-814). A friend and privy councillor of Charlemagne, and the most distinguished poet of his age. He filled the highest offices, and in 790 became Abbot of Centula (the present St. Riquier). In 800 he assisted in Rome at the coronation of the Emperor, who called him the "Homer of the age." By Bertha, the daughter of Charlemagne, he was father of two sons, Harnid, and Nithard, the historian.

ANGI'NA PEC'TORIS (Lat. tightening of the chest or heart), or Heart-stroke. It is characterized by intense pain and sense of constriction, which occur in paroxysms beginning over the region of the heart, or deep in the chest, and extending toward the left shoulder. The attacks are apt to appear in succession, and ultimately they kill the patient. As to the true pathological basis of angina pectoris we are still uncertain. Changes in the heart, aorta, and arteries, varying from extensive valvular disease to a mild arterio-sclerosis, have been described. These changes are, however, not constant, and are also found in cases which die with no symptoms of angina. There is usually disease of the coronary or heart arteries, of the nature of an arterio-sclerosis or thickening of the walls. This may be especially marked at the origin of the vessels, and leads to a diminution in lumen. Various theories have been advanced as to the true nature of angina. It has been considered as a neuralgia of the cardiac nerves, as a cramp of the heart muscle, as due to extreme dilatation of the heart—the tense muscle pressing the nerve endings—and as a temporary anæmia of the heart muscle due to disease or spasm of the vessels supplying it with blood. It must be admitted, however, that such suggestions are purely theoretical, and that a definite pathological basis of angina is as yet undetermined. Angina pectoris is a disease of adult life, occurring most frequently between the ages of forty and fifty. The paroxysms may be induced by any excess in diet, by exertion, as walking uphill or against a strong wind, or by mental emotions. It is therefore advisable for those who have had an attack of angina to lead a quiet, regular life, avoid excesses of all kinds, and particularly refrain from mental excitement. During an attack the physician usually administers morphine, nitrite of amyl, nitro-glycerin, or chloroform.

ANGIOLIERI, ăn'jô-lyā'rê, Cecco (c. 1250-c. 1312). An Italian humorous poet of Dante's time, born at Siena, not earlier than 1250. He sang of his quarrels with his father, his misadventures in love, and the poverty under which he suffered. His verse is original in form. No fewer than three sonnets are devoted to Dante, who, it is inferred, charged him with being a parasite, for in the last of these sonnets Cecco hurls the epithet back at him with a vigor which must have severed their relations once for all. Cecco himself figures in one of the tales of the *Decameron* (IX. 4). He is supposed to have died about 1312. Consult Gaspary, *Italian Literature*, Oelsner's translation (London, 1901).

AN'GIO'MA. See Tumor.

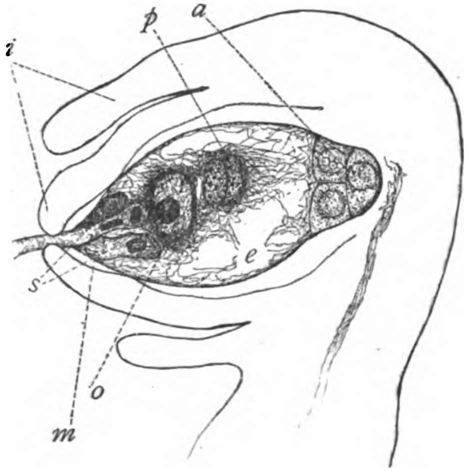
ANGIOSPERMS, ăn'jĭ-ô-spĕrmz (Gk. *ἀγγεῖον*, *angeion*, vessel + *σπέρμα*, *sperma*, seed). A name applied to the greatest group of seed-plants, Spermatophytes, as distinguished from the other group, Gymnosperms, in which the "seeds are naked." The two great divisions of Angiosperms are the Monocotyledons and Dicotyledons, once called the "Endogens" and "Exogens" respectively. The Monocotyledons are characterized by the single terminal seed leaf (cotyledon) of the embryo, the scattered woody bundles of the stem, the closed venation (often called "parallel veined"), and the three-parted flowers. To the group belong such forms as the common pondweeds, grasses, palms, aroids, lilies, and orchids. The Dicotyledons are characterized by the lateral cotyledons, the organization of the woody bundles of the stem into a hollow cylinder, the open venation (often called "net-veined"), and the five- or four-parted flowers. To this group belong such forms as the common trees (poplars, oaks, elms, etc.), buttercups, roses, peas, umbellifers, heaths, mints, composites, etc. The Angiosperms are estimated to comprise over 100,000 species, and they form the most conspicuous part of the vegetation of the earth. Since the Gymnosperms comprise only about 400 living species, it is evident that the Angiosperms are the chief modern representatives of seed-plants. It is among Angiosperms also that the true flowers are developed, with elaborate relations with insects for securing pollination. The group is often called "true flowering plants," because it is characterized by the ordinary conspicuous flower.

The members of the group are of every possible variety of habit, from minute floating forms to gigantic trees. The roots, stems, and leaves are more elaborately and variously organized for work than those of any other plant groups, and the whole structure of the body is the most complex found in the plant kingdom.

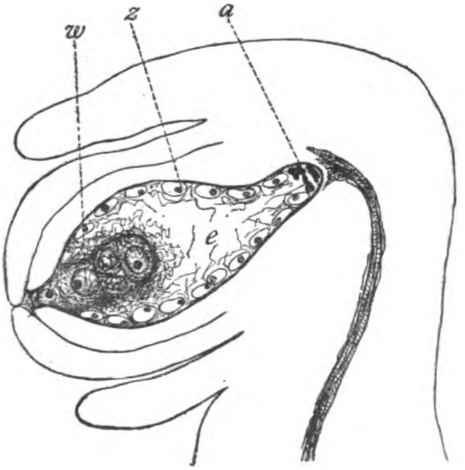
It is among the Angiosperms that "stamens" and "carpels" become definite and distinctly developed. The stamen of the Angiosperm corresponds to a spore-bearing leaf of the fern-plants, but shows no resemblance to an ordinary leaf in form. The region devoted to producing the spores is called the "anther." In observing the development of an anther it is found that four sporangia usually appear, and that as these approach maturity they fuse in pairs, resulting in the appearance of two pollen-sacs, each of which has been derived from two sporangia. Occasionally in Angiosperms the four original sporangia of the stamen remain distinct.

The carpels of Angiosperms give name to the group, for these structures inclose the ovules that become seeds, the name angiosperms meaning, as has been said, "seeds in a case." In this regard they differ decidedly from any carpels which exist among the Gymnosperms, in which group they are flat and open, exposing the ovules, and giving rise to the name, which means "seeds naked."

In order to understand the following statement of the technical characters of angiosperms, it will be necessary to read the articles ALTERNATION OF GENERATIONS, and HETEROSPORY.



A mature embryo-sac (*e*), showing the three antipodal cells (*a*), the two polar nuclei fusing to form the endosperm nucleus (*p*), the two synergids (*s*), the egg (*o*), and the pollen-tube entering to discharge its sperm cells. The two integuments (*i*) of the ovule are also shown.



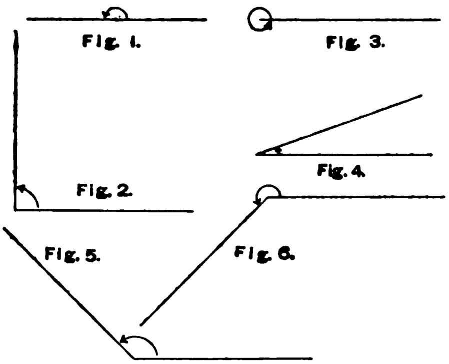
An embryo sac (*e*), showing the young embryo (*w*), endosperm cells (*z*), and the three disorganizing antipodal cells (*a*).

In its germination the pollen grain (*microspore*) produces within itself usually three cells, which represent a very much reduced male plant. One of these cells later develops the pollen tube, which penetrates to the egg, while the other two cells are the sperms. The embryo sac within the ovule, which represents a single unshed spore, produces within itself a group of cells, usually seven in number, which represent a reduced female plant. In the end of the sac toward the micropyle (the opening left by integument) the single egg is situated, and associated with it are two other cells called *synergids* (helpers). This group of three cells is called the egg apparatus. At the opposite end of the sac is a group of sterile cells, usually three in number, and called the antipodal cells. More centrally placed in the sac is the seventh cell, that has been formed by the fusing of two cells, and, after the fertilization of the egg, is to develop the endosperm (nutritive tissue of the seed). This cell is called the "definitive nucleus" or "primary endosperm nucleus." Before fertilization, the pollen grain containing the male plant is transferred by the wind or by insects to the stigma (receptive region of the pistil), the process of transfer being called pollination (q.v.). After pollination the pollen tube is developed, which penetrates the pistil and finally reaches the ovule, carrying in its tip the two male cells or sperms. The tip of the tube then enters the micropyle, crowds its way to the egg, and discharges its contents. One sperm passes to the egg and fuses with it, this act being called fertilization. The other sperm has recently been observed to pass on in the sac and fuse with the endosperm nucleus; but it remains to be seen how general this phenomenon, called double fertilization, may be in the group.

ANGLAISE, äɴ'glāz'. An English country dance (*contredanse*), in 2-4, 3-4, or 3-8 time. It is gay, and probably originated in the older form of the French *rigaudon*. See RIGADOON.

AN'GLE (Lat. *angulus*, a corner, Gk. ἀγκύλος, *ankylos*, bent). One of the common geometric concepts. If two lines meet, they are said to form an angle, the lines being called the arms, sides, or legs, and the point of meeting the vertex of the angle. The size of the angle is determined by the amount of turning necessary to carry a moving radius from one arm to the other, and hence is independent of the length of the arms.

If the arms of an angle are in the same straight line on opposite sides of the vertex, a straight angle (fig. 1) is formed; half of a straight angle is called a right angle (fig. 2); two straight angles equal a perigon or angle of 360° (fig. 3). Angles are also conceived exceeding 360°; thus an angle of 720° is described when a screw is turned twice around. An angle between 0° and 90° is said to be acute (fig. 4); one between 90° and 180°, obtuse (fig. 5); one between 180° and 360°, reflex (fig. 6). Angles are considered as positive if generated by a radius moving counter-clockwise, and negative



if the radius moves clockwise. If the arms are straight, the angle is said to be *rectilinear;* if curved, *curvilinear;* if arcs of great circles on a sphere, *spherical.* Curvilinear angles have the same measure as the rectilinear angles formed by tangents to the curves at the vertex. If two planes meet, they are said to form a *dihedral* (Gk. two-seated) angle; this has the same measure as the rectilinear angle formed by two lines in the planes that are perpendicular to the line of intersection of the planes. If three or more planes meet in one point, they are said to form a *solid* angle, the measure of which is the ratio of the intercepted surface to the entire surface of any sphere having the vertex of the angle as its centre. A solid angle is *trihedral, tetrahedral,* etc., according as it is formed by 3, 4, etc., planes. For the various attempts made to define the simple concept angle, consult Schotten, *Inhalt und Methode des planimetrischen Unterrichts* (Leipzig, 1893).

ANGLE, FACIAL. See ANTHROPOMETRY.

ANGLE I′RON. See ROLLING MILLS, for a description of this and other steel shapes.

ANGLE OF EL′EVA′TION, ANGLE OF DEPARTURE, and other terms in Gunnery. See BALLISTICS, and GUNNERY.

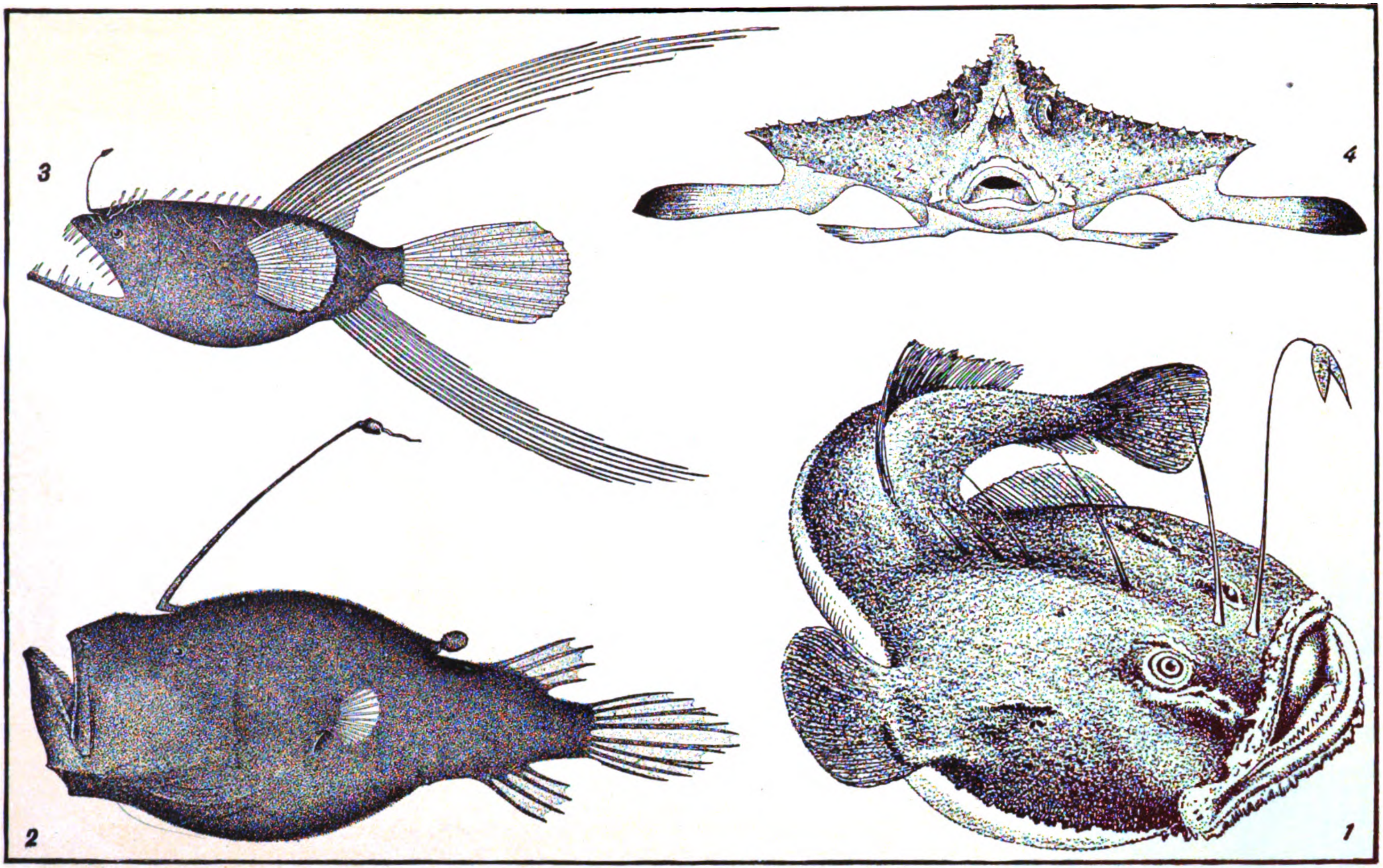
AN′GLER (The name alludes to its seeming to "angle" for its prey; see below). A singularly ugly and voracious marine fish (*Lophius piscatorius*), also known as goose-fish, monk-fish, all-mouth, and fishing-frog. It is of the order Pediculati, chiefly characterized by the greatly elongated carpel bones, which form a kind of arm supporting the pectoral fins. The angler is a large fish, three to five feet in length, having the large, flattened head with its wide mouth and projecting lower jaw, and the anterior part of the body, greatly out of proportion to the posterior tapering part. The three anterior spines have become widely separated from the dorsal fin, and shifted forward onto the head, where the most anterior is much elongated, barbel-like, and fleshy at the tip. It is by the brilliant color of this and other worm-like appendages about the mouth that the fish is said to attract smaller fishes and thus make them easy prey. The name goose-fish refers to the popular belief that it will seize geese and other swimming birds. It is a very hardy fish, and does not suffer from being out of the water as readily as most fishes. It occurs on the European shores, and on the American coast from Nova Scotia to the Barbadoes. Some deep-sea fishes of a closely related family (Antennariidæ) are sometimes included under the same name, and apparently have similar habits. See FROG-FISH, and plate of ANGLERS AND BATFISH.

AN′GLES. A Low German tribe who occupied the district of Angeln in Schleswig-Holstein, and extended to the west as far as the North Sea. With the Jutes and the Saxons, the Angles passed over in great numbers to Britain during the fifth century, and settled in East Anglia, Northumbria, and Mercia. From them England derives its name (Lat. *Anglia*, A. S., *Engla-land*). After these migrations from Schleswig, the Danes from the north entered the deserted districts, and mingled with the Angles who remained there. The German language and manners were afterward introduced by immigrant nobles from Holstein, and prevailed among the higher classes; but until the nineteenth century the Danish was still generally spoken by the common people. During the nineteenth century the German gained the ascendency. The modern Angles are of a more passive disposition than the Frieslanders and the people of Ditmarschen, and religious sentiment is very strongly manifested among them. The district called Angeln extends from the Schlei on the south to the Flensburg hills on the north, contains about 330 square miles, and a population of about 38,000. Kappeln is the chief town. The name has no political or administrative significance. Consult Erdmann, *Über die Heimat und den Namen der Angeln* (Upsala, 1891).

ANGLESEY, ăṉ′gl’-sē̆, or **ANGLESEA** (A. S. *Angles' ēg*, the Angles island). A county and island of Wales, separated from the mainland by the Menai Strait (Map: Wales, B 3). Its length is about 20 miles, breadth about 17, coast line about 80, area 275 square miles. The county is divided into three districts, called cantrefs, each subdivided into two cwmwds. The market towns are Amlwch (a flourishing little seaport of 5306 inhabitants), Beaumaris (q.v.), the county town, Holyhead (q.v.), Llangefni, and Llanerchy-medd. Pop., 1891, 50,098; in 1901, 50,590. The surface is generally flat, and the soil of indifferent fertility and only partially cultivated, by far the largest part being under pasture. The principal products are wheat, barley, oats, and potatoes. The mineral deposits of the island are still important, though not so extensive as 100 years ago, when the Parys and Mona copper mines were considered the most productive in England. Among the minerals the most important at present are copper, lead, silver, marble, limestone, asbestos, and coal. The island is connected with the mainland by one suspension bridge and the Britannia tubular bridge on the route of the Chester and Holyhead Railway. The island is traversed by two railway lines. There are still to be found some ancient relics of Druidism, which once flourished on the island. The Welsh language is largely spoken by the peasantry. Consult H. L. Jones, "The Mediæval Antiquities of Anglesey," in Volume V., *Archæological Journal* (London, 1844).

ANGLESEY, HENRY WILLIAM PAGET, first marquis of (1768-1854). A British general and statesman. He was educated at Oxford and entered Parliament in 1790. He commanded a volunteer corps in Flanders, and acquired a high reputation as a cavalry officer in the Peninsular War. At the battle of Waterloo, where he commanded the British cavalry, he lost a leg. On his return to England he received a vote of thanks from Parliament, and was made Marquis of Anglesey. In 1828 he was appointed Lord-Lieutenant of Ireland at a period when that country was greatly agitated over the question of Catholic emancipation. This he at first opposed, but afterward advocated it, and in consequence was recalled by Wellington in 1829. He was again appointed to the same office under Lord Grey's administration in 1830; but his coercive measures destroyed his popularity, and he resigned his position in 1833. He founded the Irish Board of Education. In 1846 he was promoted a field-marshal.

ANGLERS AND BATFISH



1. ANGLER OR GOOSE FISH (Lophius piscatorius).
2. DEEP-SEA ANGLER (Caulophryne jordani).

3. DEEP-SEA ANGLER (Cryptosurus couesii).
4. BATFISH (Ogcocephalus vespertilio).

ANGLESITE, ăn̲′glė-sīt. A lead sulphate that crystallizes in the orthorhombic system, and occurs in white, light-yellow, green, and sometimes blue colors. It is formed as a result of the decomposition of galena, and was originally found in Anglesea, England, whence its name; it also occurs in Cornwall, Derbyshire, and Cumberland; at various localities in the Hartz; in Hungary; and in the United States, at Phenixville, Pa., at various points in the Missouri lead mines, at Rossie, N. Y., and elsewhere. Anglesite is useful as an ore of lead (q.v.).

AN′GLEWORM′. An earthworm, when used as fish-bait. See Earthworm.

AN′GLIA, East. A kingdom founded by the Angles before the middle of the sixth century, in the eastern part of central England, comprising the modern counties of Norfolk and Suffolk, and equivalent in extent to the modern see of Norwich. It was somewhat dependent on Kent; but about 654, Anglia fell under the sway of Mercia, and so continued till Egbert, King of Wessex, conquered Mercia and East Anglia, in 825. Alfred the Great gave Anglia to the Danes under Guthrum in 878; but Edward, his son and successor, forced the Danes to acknowledge him in 921. Anglia soon became a part of the West Saxon kingdom.

AN′GLICAN. Belonging to the Church of England or to the other churches in communion with it, in Scotland, Ireland, and the United States. The term is sometimes applied to the High Church party. See Anglican Communion, and England, Church of.

ANGLICAN CHURCH. See England, Church of.

ANGLICAN COMMU′NION. A term coming to be recognized as the semi-official title of the now world-wide body which is in communion with the Church of England (q.v.) as represented in its centre of unity, the see of Canterbury. It is only in comparatively recent years that this body has come to have anything like a concrete existence, which by the logic of events is crystallizing more and more, in contradiction though it be to the famous Branch Theory on which the claims of the body to be considered a part of the Catholic or Universal Church are based. Its component parts are the Episcopal Churches of England, Scotland, Ireland, the British colonies, and the United States, with a few sporadic organizations on similar lines in the Latin countries. It coheres loosely by means of general agreement in worship and terms of communion, and as an integral body is represented by its bishops from all parts of the world in the Lambeth Conference (q.v.) at irregular intervals.

AN′GLIN, Margaret (1876—). An American actress, daughter of the Hon. T. W. Anglin, who at the time of her birth, at Ottawa, Canada, was Speaker of the Canadian House of Commons. After studying at the Empire School of Dramatic Acting (New York City), she made her début at New York in *Shenandoah* in 1894. Among her rôles were Roxane, in Richard Mansfield's presentation of *Cyrano de Bergerac* (1898); Mimi in *The Only Way* (1899); Mrs. Dane, in *Mrs. Dane's Defence* (1900); Mabel Vaughn in *The Wilderness* (1901); the title rôle in Zira (1905). Consult Strang, *Famous Actresses of the Day in America* (Boston, 1899).

AN′GLING (A. S. *angel*, fish-hook, akin to Engl. *angle*, a corner, bend). The term angling has, by common understanding, become restricted to the catching of fish as a source of recreation, while the word fishing expresses it as a commercial enterprise. The term "angle" and its cognate words in most languages are limited to the hook; but it is quite clear that in Anglo-Saxon the word includes as well the line and rod; a definition probably suggested by the position a rod and pendent line take when being used for bait fishing, at which time they form a right angle. Shakespeare refers to the angle in the sense of rod, line, and hook in *Antony and Cleopatra*, and he had good historic basis for selecting angling as a recreation in Egypt, for the mural paintings of the Egyptians make it clear that angling was a favorite pastime of their men of rank. So accurately is the spawning of fish described in the *Bundahish*, a Pahlavi work relating to the creation, as to suggest the existence of angler naturalists among the followers of Zoroaster. Both Greeks and Romans pursued angling for diversion's sake. Many allusions in classical authors justify the inference that the idea expressed by our word sportsman had defined shape in antiquity. From Homer to Oppian there were piscatory poets, who dwelt on the exciting delights of the craft. Oppian's *Halieutica*, a poem of the second century A.D., treats of the natural history of fishes, and of the fishing methods of the ancients. The perfect angler is herein defined as "a well-made, active man, patient, vigilant, enterprising, courageous, and full of expedients;" and his outfit is summed up in a couplet—

> "The slender woven net, the osier creel,
> The tapering reed, the line, and barbèd steel."

The earliest mention of fly-fishing occurs in the *Epigrams* of Martial, wherein is sung the rising of the wrasse "decoyed by fraudful flies;" but Ælian, the author of a zoölogy, written about 200 A.D., gives a consummate description of this method of taking a certain species of trout as practiced by the Macedonians. From the angling pictures of Ausonius in the fourth century, there is, with the exception of a brief allusion in *Piers Fulham*, written about the year 1420, a break in the literature relating to this subject, until we reach the interesting work of Dame Juliana Berners, prioress of Sopwell Nunnery—*A Treatyse of Fysshynge wyth an Angle*, printed in England in 1496. This treatise presents detailed instructions for the manufacture of tackle, gives faultless directions for fly-fishing, and describes minutely "xij flyes wyth wyche ye shall angle to ye trought & grayllying." The flies have been tied by a modern expert, in accordance with the directions given in the treatise, and they do credit to the taste of the first English authoress. Leonard Mascall's *A Booke of Fishing with Hooke & Line* (1590), the next work of importance in English, is largely a reproduction of the essay of the literary prioress. *The Secrets of Angling*, a delightful poem by John Dennys, appeared in 1613, and in 1651 Thomas Barker's *The Art of Angling*, the first work in which the reel is recognized as essential to success in the capture of large fish with rod and line. Two years later, Walton's *The Compleat Angler; or, the Contemplative Man's Recreation*, was given to the world. It was of this book that Charles

Lamb wrote: "It would sweeten a man's temper at any time to read it; it would Christianize every discordant, angry passion." Angling is one of the richest departments of English letters. Westwood and Satchel's *Bibliotheca Piscatoria*, published as long ago as 1883, catalogues over three thousand works more or less concerning fish and fishing. Angling will be found treated in detail under three heads, viz.: fly-casting, bait-fishing, and trolling. To such as wish to understand the natural history of the objects of their pursuit as well as to master the various methods of capture, the following instructive monographs are recommended in addition to the volumes referred to in this article: Izaak Walton, *Compleat Angler; or the Contemplative Man's Recreation* (first New York edition, 1847); Günther, *An Introduction to the Study of Fishes;* Day, *British and Irish Salmonidæ;* G. B. Goode, *American Fishes* (New York, 1888); Seth Green, *Home Fishing and Home Waters* (New York, 1888); Green and Roosevelt, *Fish Hatching and Fish Catching;* Wright, *Fishes, Their Loves, Passions, and Intellects;* Cholmondeley-Pennell, *Modern Improvements in Fishing Tackle* (London, 1887); *The Angler Naturalist*, and the two volumes of the Badminton Library of Sports, entitled *Fishing;* Nobbe, *Art of Trolling*, and J. J. Manley, *Literature of Sea and River Fishing* (London, 1883). See FLY-CASTING; BAIT-FISHING; TROLLING.

AN'GLO-IS'RAELITE THE'ORY. An opinion as to the origin of the English people, held quite extensively in both Britain and America. It is maintained that the English are descended from the Israelites, who were made captives by the Assyrians under Sargon (c. 722 B.C.)—the so-called Lost Ten Tribes—and brought into Media, where they are identified with the Sacæ or Scythians, who appeared as a conquering horde there about the same time. They next swarmed westward into northern Europe, and became progenitors in particular of the Saxon invaders of England. The theory is destitute of scientific proof. The Ten Tribes were never lost; they were absorbed in the surrounding population, and so disappeared. But the vitality of the Anglo-Israelite theory is shown by the appearance of the book by M. L. Streator, *The Anglo-Alliance in Prophecy; or, The Promises to the Fathers* (New Haven, Conn., 1900, two volumes).

ANGLO-JAPANESE ALLIANCE. See JAPAN.

AN'GLOMA'NIA (A hybrid formation from *Anglo*, English + Gk. *μανία*, *mania*, madness, frenzy, enthusiasm). A term which designates, in America and other countries, a weak imitation of English manners, customs, etc., or an indiscriminate admiration of English institutions. In German literature, an Anglomania was especially prevalent in the eighteenth century, when translations of English books became numerous, and were read with great admiration. The Germans have ascribed the sentimental and affected style of some parts of their literature to the influence of the English literature of that century. But the Anglomania was harmless in comparison with the Gallomania, or imitation of French literature and customs, which prevailed in the time of Frederick II. of Prussia, and was developed in the writings of Wieland. A remarkable Anglomania prevailed in France for some time before the commencement of the Revolution. It arose out of political considerations and admiration of English free institutions, but extended to trifles even of fashions and manners, and often became very ridiculous. Gallomania was prevalent in the United States during the last few years of the Third Empire, from 1864 to 1870. The Empress Eugénie set the fashions for American women, and everything French was admired and imitated by the 'smart' set in New York and other American cities. It was at this time that the famous saying originated which declares that "when good Americans die, they go to Paris." Since the garish court of the Third Napoleon has been replaced in France by the more sober régime of the Republic, Anglomania has replaced Gallomania with our fashionable set, and has for some time been a fruitful theme of popular satire.

AN'GLO-SAX'ON ART. A term used to describe whatever works of art were produced in England during the period of about six centuries between the time of the conquest by the Angles, Saxons, and other Germanic tribes and the time of the Norman conquest in the eleventh century. They found a combination of distinct Roman and Celtic art traditions, and were influenced by them, and subsequently by Christian art from Rome and Byzantium. Their originality was shown principally in their jewelry (especially the *cloisonné*) and arms, in which, however, they had borrowed what they knew from the Goths, whose works of the same kind were far more artistic. In architecture, the Anglo-Saxons used principally wood, and relied entirely on foreign workmen for their rare buildings in stone, which were extremely plain, and this, which can hardly be called a "style," was influenced and partly superseded by the Norman style even before the Conquest. The Anglo-Saxons excelled in the illuminating of MSS., and in this they borrowed from the Irish Celts, and in their turn assisted the Irish monks in teaching the Carlovingian artists; for the great Anglo-Saxon monasteries sent masters to those in Gaul before and after the time of Alcuin.

Of the stone churches, hardly a single one survives intact, all those of any importance having been reconstructed when the Norman or the Gothic style was favored. The stone-masons, who were brought from Gaul and Rome in the seventh century to build the first stone churches, erected for Benedict Biscop the famous monasteries of Wearmouth and Yarrow; small parts of them remain. The little hall church at Bradford, entirely without columns, is almost the only complete structure remaining (705 A.D.). To about the same time belong the crypts at Ripon and Hexham. After these early works, which retain something of a Continental and Roman style, the later monuments of the ninth, tenth and early eleventh centuries, show an increase of Celtic peculiarities. The church towers have sometimes survived where the churches themselves have been renovated, and they form the most interesting group of Anglo-Saxon monuments, from such simple ones as that of Barton-on-Humber, through the more architectural examples at Barnack and Sompting, to the richer towers of Earl's Barton and Deerhurst. They are built of crude, irregular masonry—a few large blocks set in the midst of a mass of small stones. The corners are formed of long-and-short work, the high and narrow stones alternating with the flat long ones bonded into the wall. In the more elaborate examples the surface is decorated with a series of vertical lines of pilaster strips occasionally joined by arched or gabled connecting strips, and the few windows are sometimes arched, sometimes topped with two slanting straight pieces forming gables; while their jambs, or divisions (in two-light windows), are either pilasters or the peculiar baluster colonnettes not found except in this style. There are very few moldings and very little sculpture—none of it being figured. In fact, the style is so rude as hardly to rise to the dignity of art.

The Saxons were entirely without monumental sculpture or painting of native growth, and it is only in their industrial arts that their character emerges at all clearly. Even here they are inferior to the Goths in their jewelry, enameling, and goldsmith work, and to the Irish in their illuminating of manuscripts. Comparison with the Book of Kells, the Gospels of Mac-Kegol, and other Irish illuminations will prove this. It is true that the Gospels of Lindisfarne (British Museum) are equal to these works, but they were executed by Saxon pupils of the Irish monks. Another remarkably fine work is the Benedictional of St. Athelwold. In one particular the Saxon works are superior—in the treatment of the human figure, which in Irish works is a mere piece of decorative scroll-work without a trace of resemblance to the human form or real drapery. The influence of the pictures and illuminated MSS. brought to England from Rome, and of the Byzantine MSS., gave the Saxons the advantage of good models for subjects of religious art, as is shown in such works as the Cuthbert Gospels (British Museum). There are three styles in Anglo-Saxon illuminations: (1) stage of Roman influence, seventh century, when the missionaries from Rome and Benedict Biscop gave Roman models (illustrated by the Golden Stockholm Gospels and the Psalter of St. Augustine, British Museum): (2) stage of Irish influence, with predominance of the geometric ornament of beautiful elaborate designs taken from textile fabrics, metal work, and conventionalized animal forms, seventh and eighth centuries (Durham Gospels, Gospels of St. Cuthbert, British Museum, Athelwold's Book of Prayers at Cambridge); (3) stage of reactive influence of Carlovingian (Frankish) and Byzantine art, with re-introduction of figured composition and the placing of ornament in the background. This late development was rapid under the direction of SS. Athelwold and Dunstan, in the ninth and tenth centuries (Psalters of King Athelstan, British Museum; Missal of Leofric, Oxford; Gospels and Psalter of Boulogne; Gospels called "Bib. Greg." in British Museum; Cædmon, Oxford; Cotton Psalter, etc.). Certainly the peculiar interest of all the Saxon illumination lies in its immense initial letters and full-page geometric ornamentation, in which the artists rivaled the Irish in a field where neither Italian nor Byzantine illuminations had preceded them. They blazed a way which was followed by all subsequent illuminators in varying degrees; and for delicacy and precision of touch, judicious treatment of surface, and balance of composition, their geometric work has never been surpassed. In their good though simple color scheme, one point is remarkable—that they never used gold leaf. In this they influenced Carlovingian illuminators in direct opposition to the Byzantine style of profuse gold grounds and ornaments. In so far as similarities have been noticed in Scandinavian works, it is probable that they are due to influences from Great Britain rather than *vice versa*. When Charlemagne encouraged art, he found the British monasteries a great resource. The great Bible of St. Denis (British Museum) and the Leipzig Psalter are examples of this British influence on illumination among the Franks. During the last stage, when the geometric style was abandoned, extensive composition in pen-and-ink outline became a favorite method of illustration. Consult: Rickman, *An Attempt to Discriminate the Styles of Architecture in England* (London, 1848); De Baye, *The Industrial Arts of the Anglo-Saxons* (London, 1893); Akerman, *Remains of Saxon Saxondom* (London, 1853); Kemble, *Horæ Ferales* (London, 1863); Parker, *Introduction to the Study of Gothic Architecture* (London, 1847); Westwood, *Fac-similes of the Miniatures and Ornaments of Anglo-Saxon and Irish Manuscripts* (London, 1868); also volumes of the *Archæologia* (London, 1770 *foll*).

ANGLO-SAXON LAN'GUAGE AND LIT'ERATURE. The term Anglo-Saxon is employed, in popular speech and to some extent among scholars, to designate the language of the Germanic peoples in England before the coming of the Normans (1066). Such, however, was not the usage of those who wrote in the language. Alfred, Ælfric, and others repeatedly called it *Englisc*, i.e., English. True, the expressions *Angli Saxones* and *Saxones Angli*, i.e., English Saxons, occur in mediæval Latin literature, but they were used to distinguish the Saxons in England from those on the Continent. It was not until the revival of interest in England's earliest history and literature, which dates from Camden's *Britannia* (1586), that the compound "Anglo-Saxon" made its appearance, to denote, without any reference to their Continental kinsmen, the entire English people and their language. This designation was generally followed by historians and philologists down to 1875. Since then an increasing number of them have adopted the usage of King Alfred. To the earliest period in the history of the English language they have given the name Old English. The term Anglo-Saxon, it is argued, is misleading; for it seems to imply that our language before the Norman conquest was not English. It is, of course, admitted that the English language underwent great phonetic and inflectional changes in the twelfth and thirteenth centuries; and yet English has always remained English. On this continuity in the development of our speech, the proper emphasis is laid by the term Old English. For this and other reasons, it has seemed best to treat the so-called Anglo-Saxon language and literature under ENGLISH LANGUAGE, and ENGLISH LITERATURE.

AN'GLO-SAX'ON LAW. The body of law of the Anglo-Saxons. It was not until the close of the nineteenth century that historical investigation enabled one to form even a tolerably clear conception of the legal system that prevailed in England prior to the Norman conquest. The earliest written records of that system are the Anglo-Saxon "dooms," or judgments, which go back to the sixth century of our era. From the time of Ethelbert of Kent to that of Edward the Confessor these records, though fragmentary, appear in an almost unbroken series, supplemented by land charters and wills, collected through the industry of modern scholars. These give us a far from complete, but yet a fairly consistent, idea of the principles and procedure of Anglo-Saxon law. This was, even at the time of the Conquest, a primitive law, concerning itself mostly with the personal relations of free and unfree men, liegemen and lordless men, or outlaws, with crimes of violence—homicide, wounding, and cattle-stealing—and with a simple and slowly developing law of real property. Contract law, as we understand the term, did not exist. There was no distinction between willful and accidental homicide or maiming, and all crimes were punished by the infliction of heavy fines, which were graduated, not according to the atrocity of the deed, but according to the personal status or dignity of the person injured. Indeed, the law of persons consisted almost entirely of a graded valuation of the individual's life or limb, and the terms "twelve-hundred-shilling man," "two-hundred-shilling man," were the well-understood equivalents of terms of rank or personal status.

Anglo-Saxon land law was a composite of Teutonic customary law and the rules growing out of the personal and property relations of lord and vassal, the former probably predominating. Folc-land (q.v.) was the name given to land the title of which rested on the common, customary, and unwritten law. Land derived by grant from the King was known as boc-land (q.v.), the title resting on the book, or written instrument, creating it. It is in the latter that the elements of a feudal form of tenure existed; but it is probable that all forms of tenure were more or less dependent; though of feudal tenure, in the strict sense of the term, there are only a few traces before the Conquest. The allodial ownership, referred to in the books, was not the "absolute and unqualified property" in land which Blackstone and other later writers had in mind when they used the term. Sometimes it is employed as the equivalent of boc-land, and more often merely as signifying an inheritable estate. See ALLODIUM; FEUDALISM; TENURE.

The Anglo-Saxon judicial system was of the loosest possible description. The public courts—the hundred court and the county court—were popular and local in character, and had no effective process for carrying their judgments into effect. There was no supreme judicial tribunal, no *curia regis*, such as developed in the Norman period; and when the king's justice was invoked to remedy an act of injustice committed by the regular tribunals, it was an irregular and extralegal, or at least extra-judicial, power which he was called upon to exercise. Toward the close of the Saxon period, a multiplicity of private courts sprang up, the predecessors of the courts-baron of a later date. See MANOR; COURT BARON; CURIA REGIS; KING'S BENCH. Consult: Pollock and Maitland, *History of English Law*, 2d ed. (Boston, 1899), for a brief but comprehensive description; Lee, *Historical Jurisprudence* (New York, 1900); Holmes, *The Common Law* (Boston, 1881); Chadwick, *Studies in Anglo-Saxon Institutions* (Cambridge, Eng., 1905).

ANGLO-SAXONS. The collective name generally given by historians to the various Teutonic or German tribes which settled in England, chiefly in the fifth century, and founded the kingdoms which were ultimately combined into the English monarchy and nation. Various groups of them were known as Angles, Saxons, and Jutes. The traditional statement is, that the first of these invaders made their appearance in Britain in 449, having Hengist and Horsa as their leaders. But under the more searching scrutiny of later writers, these famous leaders have come to be looked upon as mythical heroes of romance, common to most of the Germanic nations; and though the fact of a great Germanic invasion in the middle of the fifth century is not doubted, it is believed that this was by no means the earliest period at which Germanic settlements were effected in England. Long previous to this period, a portion of the coast, extending from Portsmouth to Wells in Norfolk, was known as the Litus Saxonicum; but whether in reference to Saxons by whom it was settled, or to roving adventurers of that race by whom it was ravaged, is still a subject of dispute. Of the three tribes mentioned above, the Jutes are stated to have been the first comers. Their earliest home was in what is now Schleswig, North Germany, and the portions of England of which they possessed themselves were Kent, the Isle of Wight, and the opposite coast of Hampshire. The Saxons settled chiefly in the southern parts of England—in Sussex, Essex, Middlesex, the south of Hertford, Surrey, the part of Hampshire not possessed by the Jutes; also Berkshire, Wiltshire, Dorset, Somerset, Devon, and the portion of Cornwall which did not remain in the possession of its former Celtic inhabitants. The Saxons who invaded England probably belonged chiefly to the portion of that great nation, or confederacy of nations, whose territories lay on the shores of the Baltic and about the lower Elbe, occupying a region corresponding to Holstein, the north of Hanover, and the west of Mecklenburg. Of the settlements of the third tribe we have no knowledge, until we find them established along the eastern coast of Britain. Whether, as some recent historians maintain, they were Enger-Saxons, from the lower Weser, or, as most assert, Angles (q.v.) from Schleswig, a corner of which is at the present time called *Angeln*, it is certain that they made a succession of descents on the coasts of Suffolk and Norfolk, on the country to the north of the Humber, and the southern part of Scotland between the Tweed and the Forth. From these coasts they made their way inland, and eventually obtained possession of the whole of England, except the portions already mentioned; that is to say, of all the part to the north of the Avon, on the one side, and the Thames on the other, Essex, Middlesex, and part of Hertford excepted. The union of different bands of these conquerors among themselves, with their countrymen who had preceded them, and with the Celtic population which, though conquered, there is no reason to suppose was exterminated, gave rise to the so-called Heptarchy (q.v.), the kingdoms of Northumbria (originally Bernicia and Deira), Kent, Sussex, Wessex, Essex, East Anglia, and Mercia.

The various independent States into which England had till then been divided were united by Egbert, King of Wessex, in 827, into one kingdom. The royal family of Wessex, which was thus raised to the kingly dignity over the whole country, never again lost its supremacy till the Norman Conquest, except during the periods from 878 to 958, when the Danes ruled the kingdoms north of the Thames, and from 1016 to 1042, when Danish kings ruled over all of England. Indeed, all the later rulers of England, except the four kings of the Norman house, have been descended from the same line. Alfred the Great (q.v.) was the most famous king during the Saxon period. The whole ruling race eventually came to be known among themselves from the most numerous element in it, the English, and their land as Angle-land, or England. The Celtic races in Wales, Scotland, and Ireland, however, have always known them as Saxons.

Christianity was introduced among the newcomers in the latter part of the sixth century by missionaries from the Christian Scotch and Irish, to the northward, and at the same time by St. Augustine, a missionary sent by Pope Gregory I., and by his companions and successors. Augustine became the first archbishop of Canterbury; the Roman missionary movement gradually superseded the Celtic, and before the close of the seventh century the whole of England was a Christian country under one metropolitan. Ethelbert, King of Kent, was the first sovereign who embraced the Christian religion. Bringing with them the traditions and feelings of the empire, the whole influence of the clergy was thrown into the scale of monarchy, and greatly tended to its consolidation. Their custom of holding councils of prelates from all over England, and of adopting regulations for the English Church at large, also exercised a strong influence on the growth of a feeling of national unity. The English clergy in general were not very submissive to the authority of the Popes, and the connection with Rome was a very tenuous one during the whole of the Anglo-Saxon period. St. Dunstan (q.v.) was probably the most famous churchman of this period. The early English Church was distinguished for the learning and laboriousness of its clergy. Bede (q.v.) is the most eminent author whom it produced. Between his time and that of Alfred, a very great degeneracy had taken place both in the learning and efficiency of the clergy, which that active and enlightened sovereign labored to restore, but with only partial success. St. Boniface (q.v.) and many other English and Scottish missionaries labored with success in the propagation of Christianity in Germany.

The monastic system took strong hold on the Anglo-Saxons, and a number of Benedictine abbeys were founded and endowed with extensive landed possessions. Most of the bishoprics which were to remain the permanent administrative divisions of the English national Church were organized, and the primacy of the two metropolitan sees of Canterbury and York was acknowledged.

The political organization of the Anglo-Saxons before they were united under one government is almost unknown, and must have been exceedingly crude, being scarcely developed beyond tribal conditions. After the union under the West Saxon monarchy, however, they attained a considerable degree of constitutional development. The most marked characteristic was the large amount of power possessed by local assemblies or *mōts*. The township existed as an economic and administrative, but scarcely as a political, body. The political unit of the country was the *hundred*. It was a certain stretch of country or a certain body of the population whose members met from time to time for various public functions, principally judicial. The significance of the numerical expression applied to it is quite unknown. There was an official known as the *hundred's ealdor*, who seems to have presided at the hundred-mōt and exercised certain police functions. Just as a group of townships made up the hundred, so a group of hundreds made up a *shire*, the later *county*. The inhabitants of the shire also held a meeting, the shire-mōt, at which judicial cases were settled as well as at the hundred-mōt, but which seems to have existed more normally for fiscal and military purposes. The able-bodied men of the shire when called out for fighting purposes were known as the *fyrd*. The administrative and military head of the shire was the *ealdorman*, called later, in imitation of the Danish term *jarl*, the *earl*. An equally important if not so exalted official of the shire was the *shire-reeve* or *sheriff*, the representative of the King's power and interests in the shire, as the ealdorman was the representative of local independence and self-government.

At the head of the whole system of government was the King, although ordinarily he took no important political action except in conjunction with the *witan*, that is to say, the great men of the country—the prelates, the ealdormen, members of the royal family, and various royal officials. The gatherings of these magnates to determine, along with the King, on important affairs of the nation, was called the *witenagemot*, and was the direct predecessor of the royal council of the Norman period and of the House of Lords of later times. The authority of the kingship was increasing through the whole Anglo-Saxon period, and in the hands of a vigorous king overrode all limitations by the *witan;* although in case of inefficiency or doubtful succession, the latter body exercised a real power of deposition and selection. The form of election and popular acceptance was always carried out.

In early times a fundamental distinction of classes existed. The *ceorl* class were the great body of the people; the *eorl* class were the nobility by blood. The term *eorl* is not to be confused with *earl*, mentioned above, with which it has no historical connection. This distinction of classes was reflected in the amount of the money-fine imposed for murder or other violence, the payment to the injured person or to his relatives being greater in case he were of eorl rank than if he were ceorl. Members of the royal family were known as *æthelings*. Below all these classes were the *theows*, or slaves. Another distinction which seems to have grown up later and superseded the division into eorl and ceorl, was one dependent on military service or personal relationship to the king or other great man. A *gesith* or *thegn* was a personal follower of a powerful man, who usually obtained land and privileges as a result of service. Ultimately, *thegn* seems to have become a general expression for any member of the class of gentry who was not known by the higher title of earl, ealdorman or ætheling.

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Turner, *History of the Anglo-Saxons* (ib., 1799-1805); Chadwick, *Studies in Anglo-Saxon Institutions* (New York, 1905). See ENGLAND.

ANGOL, ȧn-gōl′. Capital of the department of Angol, and of the province of Malleco, Chile, 70 miles southeast of Concepcion. It is on a branch railway extending 45 miles southward to Traiguen. Pop. in 1885, 6331; 1895, 7056; 1903, 7896.

ANGOLA, ȧn-gō′lȧ (Portug. for the native name *Ngola*). A Portuguese colony in West Africa, extending from 6° to 17° S. lat. and from 12° to about 25° E. long. (Map: Africa, F 6). It is bounded by German Southwest Africa on the south, British Central Africa on the east, and Congo Free State on the east and north. Its coast line on the Atlantic is about 1000 miles long, and its entire area, including the small possession of Kabinda, north of the Congo, is 490,463 square miles. The surface is very mountainous in the west, where some of the peaks reach an altitude of about 8000 feet. In the interior there is also an extended range of mountains. The coast line forms a great number of harbors, the most important of which are Loanda, Lobito, Benguela, and Mossamedes. The rivers are mostly short, and usually dry up during the arid season. The two most important and only navigable rivers are the Kwanza and Kunene, both flowing into the Atlantic. The temperature varies considerably, owing to the uneven formation of the surface. The rainfall is heavier in the northern part and in the vicinity of the coast than in the southern part of the colony. The agricultural products of Angola consist of manioc, coffee, bananas, sugar-cane, tobacco, and cereals. The land is held mostly in very large plantations by the Portuguese, and the condition of the native farm laborers is very close to actual slavery.

The trade is chiefly with Portugal. The chief articles exported are coffee, rubber, ivory, wax, and fish. The imports consist mainly of food products and textiles. The total value of the imports and exports for 1903, exclusive of the district of Congo, was 5,498,393 milreis ($5,938,264) and 5,083,636 milreis ($5,490,327). The principal port is Loanda, the capital of the colony, with a very considerable shipping. There is a railway line about 280 miles long connecting Loanda with Ambaka, which is planned to be extended to Malanje. Several lines are also planned to be constructed in the southern part of the country. The telegraph lines of Angola had a total length of 1557 miles at the end of 1904. The finances of the colony are in a rather strained condition, in spite of heavy taxation. The budget for 1905-6 gives the revenue as 1,549,101 milreis ($1,673,029), expenditures 2,336,847 milreis ($2,523,795). For administrative purposes the colony is divided into six districts, which are controlled by the Portuguese Government, but the greater part of Angola is under the rule of native chiefs. At the head of the colony is a governor, appointed by the Portuguese Government. The population is estimated at 3,800,000, the bulk of it consisting of Bundus. The number of Europeans is comparatively small, only about 4000; but they have exercised a great modifying influence on the native population inhabiting the western part of the colony as regards their customs and economic condition. The aborigines in the interior have retained their ancient institutions intact. The authority of Portugal in the western part of Africa was first established by the Portuguese explorer, Diogo Cam, who visited the estuary of the Congo in 1484. Very little, however, was done by the Portuguese Government to extend its rule further inland, and in the middle of the sixteenth century it was almost entirely superseded by the Dutch. Gradually, by definite treaties, the Portuguese possessions in West Africa were extended to their present proportions. The claim of Portugal to the lower Congo was settled by compromise at the Berlin Conference of 1885, when she was awarded the territory of Kabinda north of the Congo.

Consult: J. de Vasconcellos, *As Colonias Portuguezas* (Lisbon, 1897); Châtelaine, *Angola* (Washington, 1893).

ANGOLA. A town and the county seat of Steuben County, Ind., 41 miles north by east of Fort Wayne, on a branch of the Lake Shore and Michigan Southern Railroad (Map: Indiana, D 1). It is the seat of the Tri-State Normal College. The town was settled about 1834 and incorporated about 1866. Population in 1890, 1840; in 1900, 2141.

ANGO′RA (ancient Gk. Ἄγκυρα, *Ankyra*; Lat. *Ancyra*; Turk. *Enguri*). The capital of the Turkish vilayet of the same name, in the mountainous interior of Asia Minor, and distant from Constantinople about 220 miles. The city is fabled to have been built by Midas, the son of the Phrygian Gordius. It was a flourishing city under the Persians; became the capital city of the Gallic Tectosages, who settled in Asia Minor about 277 B.C.; was a principal seat of eastern trade under the Romans, and was made the capital of the Roman province of Galatia Prima. It was the seat of one of the early churches of Galatia, and the scene of two Christian councils, held in 314 and 358. A decisive battle between the Turks and Tartars was fought near Angora in 1402, in which Timur defeated and took prisoner the Sultan Bajazet I. A temple of white marble was erected by the citizens of Ancyra to the Emperor Augustus, who had greatly beautified the city, and his deeds were recorded in inscriptions upon a number of tablets and the columns of an altar. These inscriptions, the *Monumentum Ancyranum*, discovered by Busbecq in 1553, are important for the elucidation of ancient history. They were first printed in Schott's edition of *Aurelius Victor* (Antwerp, 1579), and have been edited by Mommsen (Berlin, 1883) and Willing (Halle, 1897). The present Angora contains about 30,000 inhabitants, of whom one-third are Armenians. The district is famous for its breed of goats, with beautiful silky hair eight inches long. Of this goat-hair a kind of yarn is made, known as Turkish yarn or camel yarn, of which a manufacture of camlets is extensively carried on in Angora itself. Many animals in this region are characterized by the length and softness of their hair, especially dogs, rabbits, and cats. This seems to depend upon the climate, and soon disappears in Europe. See Wright, *Cities of Paul* (Boston, 1905).

ANGORA CAT, GOAT, etc. See CAT; GOAT, etc.

ANGORNU, ăn′gôr-nōō′. See NGORNU.

ANGOSTURA, ăn̲′gŏs-tōō′rȧ. See CIUDAD BOLÍVAR.

ANGOSTURA BARK, or **ANGUSTURA BARK**, or CUSPARIA BARK. The aromatic bitter bark of certain trees of the natural order Rubiaceæ and tribe Cusparieæ, natives of Venezuela and other countries of South America. It derives its name from the town of Angostura, whence it is exported. It is said to have been used in Spain as early as 1759. It has been employed as a remedy for weakness of digestion, diarrhea, dysentery, and fevers. It is tonic and stimulant. The most important of the trees producing it is the Galipea officinalis, which grows upon the mountains of Colombia and near the Orinoco. It is a tree 12 to 20 feet high and 3 to 5 feet in diameter, having a gray bark, trifoliate leaves, with oblong leaflets about 10 inches long, which, when fresh, have the odor of tobacco, and flowers about an inch long, in racemes, white, hairy, and fragrant. The bark contains a chemical substance called *angosturin*, *cusparin*, or *galipein*, to which its medicinal efficacy is ascribed. It is supposed that a variety of Angostura bark is produced by Galipea cusparia (called by some Bonplandia trifoliata), a majestic tree of 60 to 80 feet in height, with fragrant trifoliate leaves more than 2 feet long. Angostura bark was formerly believed to be one of the most valuable of febrifuges; but its use is at present very limited, and has, indeed, in some countries of Europe been prohibited, in consequence of its frequent adulteration with the poisonous bark of the Strychnos nux vomica, or the substitution of that bark for it. This poisonous bark is sometimes called false Angostura bark. It differs from the true Angostura bark in having no odor, in its much greater weight and compactness, in its inner surface being incapable of separation into small laminæ, and in the effects which are produced upon it by acids and other tests, particularly in its outer surface being rendered dark-green or blackish by nitric acid, while that of the true Angostura bark is rendered slightly orange-red.

ANGOULÊME, äɴ′gōō′lâm′. The capital of the department of Charente in France, and formerly of the province of Angoumois. It is built upon a ridge, down the north slope of which straggle the quaint houses and crooked streets of the old town (Map: France, G 6). The new town occupies the south slope. It is situated on the Charente, and among its industries are a number of paper mills and manufactures of wine, brandy, woolen stuffs, linen, and earthenware. It possesses a royal college, a museum of natural history, a naval academy, a theological seminary, and a library of 22,000 volumes. It is the seat of a bishop, and the cathedral of St. Peter dates from 1101. The founding of the see took place in 379, and Clovis built the earliest cathedral in 507. In the centre of the town stands the remnant of the ancient castle of Angoulême, in which was born Margaret of Navarre, the author of the *Heptameron* and other works. Pop., 1901, 37,650. Consult: Castaigne, *La Cathédrale d'Angoulême* (Angoulême, 1834); Nanglard, *Fouille historique du diocèse d'Angoulême* (Angoulême, 1894-97); Babinet de Rencogne, *L'Histoire du commerce et de l'industrie en Angoumois* (Angoulême, 1878-79).

ANGOULÊME, Charles de Valois, Duc d' (1573-1650). The illegitimate son of Charles IX. of France and Marie Touchet. Until 1619, he was known as Comte d'Auvergne. He was imprisoned in the Bastille from 1605 to 1616 for having plotted against Henry IV. He was then released by Louis XIII. and restored to his rank in the army, which he commanded at the siege of La Rochelle in 1628. He left some memoirs of the reigns of Henry III. and Henry IV.

ANGOULÊME, Louis Antoine de Bourbon, Duc d' (1775-1844). The eldest son of Charles X. of France and Dauphin during his father's reign. He retired from France with his father (who was then the Comte d'Artois) at the beginning of the Revolution, and spent some time in military studies at Turin. In August, 1792, he entered Germany at the head of a body of French *émigrés*, and soon after retired to Edinburgh. In 1799 he married his cousin, Marie Thérèse Charlotte, daughter of Louis XVI., with whom until 1814 he lived in exile. On the recall of his uncle, Louis XVIII., he was appointed lieutenant-general of the kingdom; but he failed in his attempt to oppose Napoleon and was forced to capitulate. After the second restoration he was sent by Louis XVIII. to the southern provinces to repress the political and religious outbreaks there, and in 1823 he led into Spain the French army, which put an end to the constitution and restored Ferdinand VII. to absolute power. He was a man of phlegmatic disposition and mean abilities. When the Revolution took place in July, 1830, he signed, with his father, an abdication in favor of his nephew, the Duc de Bordeaux (Comte de Chambord); and when the Chambers declared the family of Charles X. to have forfeited the throne, he accompanied him into exile to Holyrood, to Prague, and to Görz, where he died.

ANGOULÊME, Marie Thérèse Charlotte, Duchesse d' (1778-1851). The daughter of Louis XVI. She was imprisoned in the Temple with her parents, but in 1795 was exchanged for some French prisoners in the hands of the Austrians, and lived at Vienna till her marriage, in 1799, with her cousin, the Duc d'Angoulême.

ANGRA DO HEROISMO, äṉ′grȧ dô ā′rô-ēs′-mô (Portug. bay of heroism). The capital of the Azores, a seaport at the head of a deep bay on the south coast of the island of Terceira, lat. 38° 38′ N., long. 27° 12′ W. (Map: Portugal, B 5). It is a station for ships between Portugal and Brazil and the East Indies, but the harbor is very much exposed. It is the seat of the Portuguese governor-general of the Azores and of the bishop; is well built, but dirty; strongly fortified, and protected by a citadel at the foot of the Monte de Brazil; contains a military college and arsenal, several scientific and literary societies, a cathedral, and numerous churches. There is a considerable export of wine, cheese, honey, and flax. This city furnished an asylum for the Portuguese regency from 1830 till the taking of Oporto, by Dom Pedro (1833). Pop., 1900, 10,788.

ANGRA PEQUEÑA, äṉ′grȧ pȧ-kā′nyȧ (Sp. *pequeña*, little, small; see Angra). A settlement and a bay in German Southwest Africa (q.v.). It has the best sheltered harbor in the German possessions in that part of the continent (Map: Africa, F 7). The commercial importance of the bay has almost entirely disappeared on account of the lack of fresh water and the general barrenness of the surrounding country. The settlement of Angra Pequeña was established by the Bremen merchant Lüderitz, in 1883, and it was the nucleus of the present German Southwest Africa. It was at Angra Pequeña that the

German flag was first planted on African soil, in 1884.

ANGRI, ăn′grē. A city in south Italy, four miles east of Pompeii (Map: Italy, F 11). It has a castle and a park, and silk and cotton factories. South of the city, on the ancient Mons Lactarius, Teja, the last king of the Ostrogoths, was defeated by Narses in 553. Pop., 1881, 7700; 1901 (commune), 11,219.

ANGSTRÖM, ăng′strẽm, Anders Jöns (1814-74). A Swedish physicist. He entered the University of Upsala in 1833; became privat-docent in physics in 1839, keeper of the astronomical observatory in 1843, and professor of physics in 1858. From 1867 till his death he was secretary to the Royal Society of Sciences at Upsala. He wrote on heat, magnetism, and especially on optics. Among his works were *Recherches sur le spectre solaire* (1869), in which he published his determinations of the wave lengths of most of the dark lines of the solar spectrum known as the Fraunhofer lines; *Sur les spectres des gas simples* (1871), and *Mémoire sur la température de la terre* (1871). His best known work, *Optiska Undersökningar* (1853), treats of the principles of spectrum analysis.

ANGUIER, äN′gyā′, François, the elder (1604-69). A French sculptor. He was born at Eu, and was a pupil of Simon Guillain. After a supplementary course of two years in Italy he was appointed by Louis XIII. guardian of the cabinet of antiques at the Louvre. Among his sculptures are the following: "Henri de Chabot" (formerly at the Célestins, now at Versailles); "Jacques Augustin de Thou" (Louvre), "Gasparde de la Châtres" (Versailles), "Saint Jacques de Souvré" (Salle des Anguier, Louvre).

ANGUIER, Michel (1614-86). A French sculptor, brother of François Anguier. He was born at Eu and studied with Simon Guillain, after which he took a course of six years at Rome. Michel and François were equally gifted, and their works exhibit a remarkable similarity of feature. The masterpiece of Michel is the statue of Christ, executed in marble for the Sorbonne and now in the church of St. Roche at Paris.

ANGUILLA, ăŋ-gwĭl′la, or Little Snake (Sp. *Anguila*, àn-gē′là; dimin. of Lat. *anguis*, serpent, snake). One of the British West India Islands, about 150 miles east of Porto Rico (Map : West Indies, Q 5). It is about 17 miles long and 4 miles broad, with an area of 35 square miles, and a population of (1903) 4026, mostly negroes. The industries are cattle raising and the production of salt, obtained from a lake in the centre of the island.

ANGUS, ăn′gŭs, Earls of. See Douglas, Family of.

ANGUS, Joseph, D.D. (1816-1902). A Baptist educator, born at Bolam, Northumberland, England. He was educated at the University of Edinburgh, and became president of the Baptist Regents' Park College, in London, in 1849. He was a member of the Bible Revision Committee, and is well known as the author of the *Bible Handbook* (London, 1854), *Handbook of the English Tongue* (1862), *Handbook of English Literature* (1868), *Handbook of Specimens of English Literature* (1866), and the commentary on Hebrews in Schaff's *International Commentary* (1883).

ANGUSSOLA, àn-gōō′sō-là, or **ANGUISCIOLA,** àn-gwē′shō-là, Sophonisba (1535?-1625?). An Italian portrait-painter. She was born at Cremona, where she studied under Bernardino Campi and Bernardino Gatti, representatives of the Eclectic School, and imparted her own knowledge to five sisters, who also became painters, though they never attained a prominence so great as that of Sophonisba. Angussola's fame reached the ears of Philip II., who invited her to Spain, made her court painter, and liberally rewarded her for her work. She painted portraits not only of the King, and of Queen Isabella, but also of many persons of high rank. At the death of her first husband, a Sicilian nobleman, she went to Genoa, and here married Orazio Lomenilli. In later years she became blind, and it was then that Van Dyck visited her and professed himself enlightened by her conversations on art. Of her portraits, which are to be found at Florence, Madrid, Genoa (Lomellini Palace), and in English private possession, the best-known are the numerous portraits of herself, of which there are examples in the Uffizi and at Vienna. One of her best productions is her "Three Sisters Playing Chess" in the National Gallery, Berlin.

ANGWANTIBO, ăŋ′gwàn-tē′bō. The slow lemur. See Lemur.

ANHALT, ăn′hȧlt. A duchy of the German Empire, inclosed within Prussian territory (provinces of Saxony and Brandenburg), with an area of 887 square miles (Map: Germany, E 3). The western part, adjacent to Brunswick, partakes of the mountainous character of the Hartz region, and inclines gradually toward the valley of the Elbe. The latter traverses in a western direction the main part of the Duchy, and receives the Saale, Mulde, and a few minor tributaries. Anhalt has a fertile soil well cultivated and mostly under tillage. Rye, wheat, potatoes, oats, and grasses are grown extensively. The forests occupy a considerable area, and belong chiefly to the State. The chief mineral product of Anhalt is salts of different kinds, which are worked exclusively by the Government. The output of metal ore is very limited, while the production of lignite coal amounted to 1,465,000 tons in 1905. The manufacturing and mineral industries give occupation to over 47 per cent. of the population. The chief manufactured products are metal articles, sugar, cement, bricks, soap and other toilet articles, leather, woodenware, and spirits. Exports are chiefly sugar, spirits, grains, salt, carpets, and matches. The railway lines of Anhalt have a total length of about 180 miles, and belong chiefly to the State. The constitution of the Duchy vests the executive power with the Duke, who is assisted by the Diet. The latter is composed of thirty-six members, elected indirectly for a period of six years. The immediate executive authority is vested in the Minister of State. Anhalt is represented by one member in the Bundesrath and two deputies in the Reichstag of the German Empire. For purposes of local administration it is divided into six circles. The budget for 1905-6 balanced at 26,289,000 marks ($6,257,000). The revenue is derived from taxes, customs, and State domains, mostly salt works. The military organization of the Duchy is under the control of Prussia. Education, elementary as well as secondary, is well provided for by the State. The State religion is Protestant, but the Catholic and Jewish religions are also subsidized to some extent. According to the census of 1900, the population of Anhalt was 316,085, showing an increase of more than 16 per cent. for the decade. Over 96 per cent. of the population is Protestant. Capital, Dessau (q.v.).

The reigning house of Anhalt traces its origin to Albert the Bear, Margrave of Brandenburg, upon the death of whose grandson, Henry I., in 1252, the Anhalt territories of the family were divided into three parts, which gave rise to the related families of Bernburg, Aschersleben, and Zerbst. The subsequent history of Anhalt is a monotonous succession of reunions and reparcelings. All the parts were united between 1570 and 1586, and were then broken up again into four parts, Dessau, Bernburg, Köthen, and Zerbst. By the successive extinction of the last three lines, Anhalt was definitely reunited in 1863.

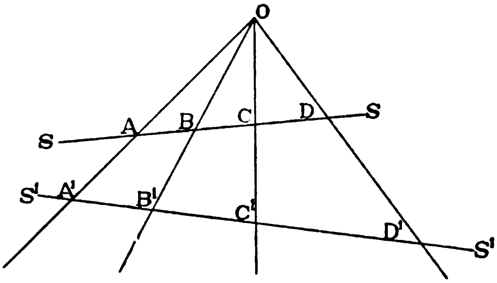
ANHALT-BERNBURG, -bĕrn′bụrk, CHRISTIAN, PRINCE of (1568-1630). A German general, founder of the Anhalt-Bernburg branch of Anhalt. In 1608 he took a leading part in the formation of the so-called Union of the Protestant German Princes directed against the encroachments of the Catholics. After acting as second commander of the army of that league, he entered the service of King Frederick of Bohemia, and led the army which was defeated by Tilly at Prague (1620).

ANHALT-DESSAU, -dĕs′ou, LEOPOLD I., fourth PRINCE of (1676-1747). A Prussian field-marshal. He entered the Prussian service at the age of twelve, and succeeded his father five years later. He distinguished himself at Höchstädt or Blenheim (1704), and in Prince Eugene's brilliant campaigns in Italy. After serving as a volunteer at Malplaquet (1709), he received command of the Prussian forces in the Netherlands, and aided Marlborough in his operations against Villars. In 1712 he was made field-marshal and military counselor to King Frederick I. Under Frederick William I. Marshal Dessau aided in the reorganization of the Prussian army. As one of Frederick the Great's generals, he distinguished himself in the War of the Austrian Succession, in which he gained a bloody victory over the Austrians at Kesseldorf in 1745. To his soldiers Leopold of Anhalt-Dessau was known as "Der Alte Dessauer" (Old Dessau). Carlyle, in his *Frederick the Great*, speaks of him as "a man of vast dumb faculty, dumb but fertile, deep—no end of imagination—no end of ingenuities—with as much mother wit as in whole talking parliaments." There are numerous lives of him in German; the best ones are those of Varnhagen von Ense (Leipzig, 1872) and Crousaz (Berlin, 1875). There is an incomplete autobiography, edited by Hosaus, *Selbstbiographie des Fürsten Leopold*. Consult also Carlyle, *Frederick the Great* (London, 1858).

AN′HARMON′IC RA′TIO (Gk. ἀν, *an*, priv. + ἁρμονία, *harmonia*, harmony, agreement). An important form of ratio introduced by Möbius under the name *Doppelverhältniss* (double ratio), but called by Chasles *rapport anharmonique*. If a pencil of four lines with vertex O are cut by any transversal SS in points A, B, C, D, $\frac{AB\cdot CD}{AD\cdot BC}$ is called the anharmonic ratio of the points and also of the pencil, and is symbolized by $\{O, ABCD\}$, or simply $\{ABCD\}$. Since $\frac{AB\cdot CD}{AD\cdot BC} = \frac{\sin AOB\cdot \sin COD}{\sin AOD\cdot \sin BOC}$, the anharmonic ratio is the same for any transversal, such as $S'S'$, of given pencil, so that

$$\{ABCD\} = \{A'B'C'D'\}$$

The anharmonic ratio $\{ABCD\}$ admits of certain interchanges of letters without altering the value of the ratio. In fact, of the twenty-four permutations of the letters only six give different anharmonic ratios, and these six are thus related: If $\{ABCD\} = \lambda$, then



$$\{ABDC\} = \frac{1}{\lambda}$$

$$\{ACBD\} = 1-\lambda \quad \{ACDB\} = \frac{1}{1-\lambda}$$

$$\{ADBC\} = \frac{\lambda-1}{\lambda} \quad \{ADCB\} = \frac{\lambda-1}{\lambda}$$

When the segments are so related that the value of the anharmonic ratio is 1, the ratio is called *harmonic*. The subject of anharmonic ratio plays an important part in projective geometry. Consult Cremona, *Elements of Projective Geometry* (London, 1885). See GEOMETRY.

AN′HIDROT′ICS (Gk. ἀν, *an*, priv. + ἱδρώς, *hidrōs*, sweat). Drugs which diminish the secretion of sweat. They are chiefly used in the profuse night-sweats of phthisis. The most important are: Atropine, picrotoxin, agaricin, camphoric acid, sulphuric acid, and gallic acid (qq.v.).

ANHIMA, ăn′hê-mȧ (Brazilian name). The horned screamer, one of the curious South American birds of the family Palamedeidæ. See article SCREAMER.

ANHIN′GA. A generic and native name in South America of the snake-birds, or darters (family Anhingidæ). See DARTER, and illustrations on plate of FISHING BIRDS (for similar species).

ANHOLT, ăn′hōlt. An island belonging to the district of Randers, Denmark, situated in the centre of the Kattegat, about 22 miles from the peninsula of Jutland and the mainland of Sweden (Map: Denmark, E 2). Anholt Island has an area of eight square miles, and is nearly twice as long as it is broad. At the eastern end is a lighthouse to mark the dangerous shoals and reefs of the neighborhood. Pop., 300.

ANHY′DRIDE (Gk. waterless, from ἀν, *an*, priv. + ὕδωρ, *hydōr*, water). An oxide which combines with water to form an acid, or an oxide which combines with a basic oxide to form a salt.

Sulphuric oxide (SO_3) when added to water (H_2O), forms sulphuric acid (H_2SO_4); sulphuric oxide is, therefore, termed the anhydride of sulphuric acid. Again, chromic oxide (CrO_3) combines with barium oxide (BaO), yielding barium chromate ($BaCrO_4$); chromic oxide is, therefore, classed as an anhydride.

ANHY'DRITE (Gk. ἀν, *an*, priv. + ὕδωρ, *hydōr*, water). An anhydrous calcium sulphate that crystallizes in the orthorhombic system. It is found crystallized, fibrous, finely granular, or scaly granular. A scaly granular variety from Vulpino, in Lombardy, Italy, takes a fine polish, and has been used for sculpture. In the United States it is found in Lockport, N. Y., near Nashville, Tenn., and extensively in Nova Scotia.

ANI, ä'nē (native Brazilian name). A bird of the genus Crotophaga, inhabiting the warmer parts of America, and related to the cuckoo. Three species are known, the most common of which (*Crotophaga ani*) is found in Florida, the West Indies, and tropical America, where it is known as the "black witch," "savannah blackbird," and "rain crow." The anis are birds of medium size, about one foot in length, and having a black, lustrous plumage with blue and violet reflections. The tail contains only eight feathers, the smallest number credited to any living bird. The bill is exceedingly compressed, the upper mandible forming a thin crest. The nests are built in bushes, and the eggs are greenish overlaid with a white chalky substance. One species is said to be communistic, several individuals uniting to form a large nest, which they use in common, and the practice may be common to the tribe. A Costa Rican species (*Crotophaga sulcirostris*) is named "el garapatero" because it accompanies cattle in the fields, settles on their backs, and picks from their hides the ticks which are called *garapatos*. For illustration, see CUCKOO.

ANICET-BOURGEOIS, ä'nē'sā' bōōr'zhwä', AUGUSTE (1806-71). A French dramatist, born in Paris. The splendid success of a melodrama, *Gustave, ou le Napolitain* (Gaîté, 1825), which he wrote at the age of nineteen, induced him to follow a literary career. He soon became a collaborator with some of the leading authors of France, such as Lockroy, Decourcelle, Labiche, and Brisebarre. Among the vaudevilles and comedies produced in this way were: *Père et parrain* (1834), *Passé minuit* (1839), *Les trois épiciers* (1840), *Le premier coup de canif* (1848), *L'avare en gants jaunes* (1858), *Les mariages d'aujourd'hui* (1861). In conjunction with Barbier, Cornu, Lockroy, Masson, Féval, and others he composed several melodramas, such as: *Le couvent de Tonnington* (1830), *Périnet Leclere* (1832), *La nonne sanglante* (1835), *Marceau, ou les enfants de la République* (1848), *La dame de la Halle* (1852), *L'aveugle* (1859), *Le bossu* (1862). His independent works include: *La Vénitienne* (1834, one of his best efforts); *La pauvre fille* (1838), and *Stella* (1843). Anicet-Bourgeois was a master of dramatic technique, and was unsurpassed in the field of the melodrama. He wrote in all nearly two hundred pieces, many of which, however, were composed in collaboration with others, such as Dumas, for example, under whose name many of Anicet-Bourgeois's productions are still performed.

AN'ICE'TUS (?-168). A bishop of Rome from about 157 to 168 A.D. About 160 A.D. he conferred with Polycarp to determine the proper time for celebrating Easter, but they came to no agreement. Although it is not certain that he was a martyr, he is so called in the Roman and other martyrologies. He is commemorated as a saint by the Roman Church on April 17.

AN'ILINE (From *anil*, Ar. *an-nil*, for *al*, the + *nil*, from Skr. *nili*, indigo), AMIDO-BENZENE, or PHENYL-AMINE, $C_6H_5NH_2$. A liquid organic substance extensively used in the manufacture of dyes. Pure aniline is colorless, has a faint, somewhat disagreeable odor, and boils at 183° C. When exposed to the action of air and light, it gradually turns dark red. It combines with acids to form salts, such as aniline hydrochloride, $C_6H_5NH_2.HCl$. It may be readily prepared by the reducing action of nascent hydrogen on nitrobenzene, according to the following chemical equation:

$$\underset{\text{Nitrobenzene}}{C_6H_5NO_2} + 6H = \underset{\text{Aniline}}{C_6H_5NH_2} + 2H_2O$$

On a small scale the reduction is most conveniently effected by slowly adding strong hydrochloric acid to nitrobenzene placed in a flask with granulated tin; the product of the reaction, a compound of aniline and chloride of tin, is decomposed with soda, and the aniline thus set free is separated from the mixture by distilling with a current of steam. On a large industrial scale aniline is made as follows. A small quantity of ground scrapings of soft iron castings, technically called *swarf*, is introduced, together with some water, into a large cast-iron still furnished with powerful agitators. Crude hydrochloric acid is then added, and nitrobenzene is allowed slowly to flow into the still; at the same time, through another opening, the rest of the swarf to be employed in the operation is allowed to flow into the still in a steady stream. After the first energetic action has subsided, the reacting mixture is heated with a current of steam introduced into the apparatus through several pipes. Six to eight hours suffice to transform all the nitrobenzene employed in one operation. The process may be called continuous, since the acid employed serves merely to start the reaction, and might, theoretically, be used in reducing an indefinite quantity of nitrobenzene, the reduction being effected by the iron and water. In reality, however, a portion of the acid remains combined as ferrous chloride, most of the iron being transformed into its magnetic oxide, Fe_3O_4, technically called *black stuff*. All the aniline brought into commerce is made in this manner. Aniline was first discovered in 1826 by Unverdorben, among the products obtained in the destructive distillation of indigo. In 1834 Runge found it in coal-tar; in 1841 Zinin obtained it by reducing nitrobenzene with sulphuretted hydrogen, and in 1843 Hofmann effected the same reduction with nascent hydrogen, by the reaction of dilute acid and metals. The manufacture of aniline has been an important branch of industry since 1856, when the discovery of mauve was perfected by Perkin.

The qualities of commercial aniline adapted to certain purposes often contain, besides aniline, large quantities of other substances. Thus, crude "aniline for red" contains only about 25 per cent. of aniline, the rest being ortho-toluidine and para-toluidine, compounds chemically allied to aniline. The presence of aniline in a substance submitted for analysis may be readily detected by dissolving some of the substance in water and adding a solution of bleaching-powder: in the presence of aniline an intense purple coloration is produced. Another test for aniline is afforded by the so-called carbylamine reaction: a drop of aniline added to a mixture of chloroform and a solution of caustic potash in ordinary alcohol produces an intensely nauseous smell, due to the formation of phenyl-carbylamine (phenyl iso-cyanide), C_6H_5NC. For bibliography, see COAL-TAR COLORS.

ANILINE COL'ORS. See COAL-TAR COLORS.

AN'IMAL (Lat. a living being, from *anima*, current of air, breath of life, soul, *animus*, soul, mind; from the Skr. root *an*, to breathe). A representative of one of the two great groups of organisms, the other including plants. The distinction between animal and plant is hard to draw sharply, although the usual differences between the higher representatives of the two groups are obvious enough. Most higher animals differ from most higher plants in that their food is chiefly solid and organic, in their capacity for locomotion, in their alimentary tube, muscles, nervous system, and sense organs, in their limited growth and greater specialization of parts. This list of differences is really less formidable than it appears; it resolves itself chiefly into a difference of food, which demands that the animal shall seek the food and be provided with organs for locomotion (muscles, nervous system, and sense organs) and digestion. The difference in general form of body is due to the different methods of getting the (dissimilar) food. This difference in food (solid and organic, as opposed to fluid and inorganic) serves in a general way to divide even the lower animals from the lower plants. But most animal and plant parasites are alike in requiring liquid, organic food; even green plants use organic food (some in large quantities; see SUNDEW), and all animals require inorganic food.

Locomotion is not a distinguishing characteristic of animals, first, because great groups of animals are permanently attached; namely, among protozoans, suctoria, sponges; among cœlenterates, most hydroids and corals; crinoids (sea-lilies); bryozoans, barnacles, and most ascidians. Single cases of attached animals are found in other groups. Secondly, bacteria, diatoms, oscillaria, certain unicellular green algæ, and many plant "swarm-spores" are more or less locomotive. In respect to irritability there is little fundamental difference even between the higher animals and plants, for plants respond to the same agents as do animals, but less perfectly. The reproductive process is fundamentally the same in the two kingdoms. In their chemical composition the higher animals differ from most plants; for the former contain no cellulose, whereas the latter are largely built up of it. But cellulose is found also among animals, especially in the test of the tunicates. In their cell-structure and cell-physiology animals are almost indistinguishable from plants. The fundamental living substance, called protoplasm, is substantially alike in the two kingdoms, and it is probable that future studies will make dimmer rather than clearer the line separating them.

The principal functions of animals are connected with nutrition, locomotion, sensation and reaction, reproduction, and relation to other organisms. Nutrition involves first the acquisition of food. Food is (1) inorganic—water, oxygen, certain salts; or (2) organic—either vegetable or animal, either dead or living, passive or active. Attached animals depend mostly on dead or on passive living organisms, brought to them in currents of water. Those which live on active animals must have the most powerful organs of locomotion and sense. Solid food has to be triturated by teeth or crushing jaws, and digested in a food-canal. The fluids thus obtained pass through the wall of the food-canal either into the general body spaces or into blood vessels, which carry them to the tissues, where they are assimilated or burned for heat and energy. When the food is exclusively fluid, it may soak through the body wall, as in tapeworms, which have no alimentary tract. The oxygen required passes through the wall of the body, is imbibed with water, or enters through special thin wall-tracts of the body surface known as gills or lungs. The body space or blood vessels carry the oxygen to the tissues, where it is used in combustion and in building up the organic compounds. The waste products of catabolism in the tissues are cast into the body spaces (or blood vessels) and eliminated, either directly or by special excretory organs. See ANATOMY; ALIMENTARY SYSTEM; RESPIRATORY SYSTEM; MUSCULAR SYSTEM, and similar articles.

Locomotion involves locomotive apparatus of divers kinds, jets of water, suckers and contractile tubes, lashes, tails, cilia, paddles, fins, wings, and legs. It involves also muscles and a nervous system to control them.

All the protoplasm of the living body is irritable, but parts of the surface are told off as areas of special sense; for contact, hearing, taste, smell, sight, and temperature. To receive these impressions and to set in action appropriate movements, the central nervous system has become specialized. In the definite reactions which accompany particular situations to the world external to the animal lie the first evidences of a "psychic life." All sessile animals are characterized by lack of many sense-organs, reduction of muscular and nervous systems, and reduction of instincts.

Owing to accidents, the number of individuals tends constantly to diminish, yet it must be maintained. The single way that organisms have of making good losses or increasing their numbers is by dividing; this is the essence of reproduction (q.v.). Of especial significance is the fact that in all groups of animals the bits which have been constricted off (gametes) from time to time unite in pairs to form zygotes before going on with their development. In all reproduction, the dividing individuals give rise to two incomplete individuals, except in the case where the division separates a "germ cell" from the body that carried it. The divided pieces or the germ cells are imperfect representatives of the species: they must "regenerate" or "develop" to produce the adult condition. See EMBRYOLOGY; REPRODUCTION.

The relations of animals to other organisms are varied. Many animals, especially in the higher groups, care for their young. Many protect themselves from their enemies by concealment or by flight; others are powerful for offense and defense. On account of the mating instincts, many higher animals have gained peculiar methods of appealing to the eye or ear or smell of other members of the species.

ANIMAL CHEM'ISTRY. See CHEMISTRY, PHYSIOLOGICAL.

ANIMAL COL'ORS. The chief animal colors now in use are cochineal, kermes, and lac dye (qq.v.). See also PURPLE.

AN'IMAL'CULE (Dimin. of Lat. *animal*, living being). A popular name originally applied to any small animal, but later restricted to microscopic organisms, particularly such as are found in water. The term has no scientific standing, and is now little used except in compound names, such as *bell-animalcule, wheel-animalcule, bear-animalcule*, very different sorts of animals elsewhere described.

ANIMAL FLOW'ER. A sea-anemone or similar polyp, whose expanded colored tentacles resemble the petals of a blossom. For illustration, see SEA-ANEMONE.

ANIMAL HEAT. Heat generated in animal bodies by certain of the changes constantly taking place within them. A certain amount of heat is necessary to the proper performance of the functions of the body, and any material increase or decrease of it from the standard endangers health. The air and other objects surrounding the body being in almost all cases colder than it, are constantly stealing part of its warmth; but within the system there are processes constantly going on which produce more heat. When the heat thus generated is not dissipated fast enough, so that the body tends to become warmer than the due degree, perspiration results, the evaporation of which carries off the excess. The power of producing heat is in relation to the climate in which the animal is accustomed to live. It is weaker in warm climates than in cold, and consequently when an animal is removed from a warm to a cold climate it frequently pines and dies. In most fish and reptiles, commonly termed "cold-blooded animals," the temperature differs but little from that of the water or air in which they live; the same is the case with hibernating animals during the later part of their torpid condition. It may thus occur that the degree of temperature of "cold-blooded" animals may be higher than that of man.

Man has the power, to a greater degree than other warm-blooded animals, of adapting himself to changes of surrounding temperature. His average standard of heat is about 98.6° F. (36.8° C.), varying with circumstances, being slightly higher after exercise or a hearty meal, and at noonday than at midnight. It differs slightly in various parts of the body, the interior being from ½° F. to 1½° F. higher than the exterior. It also varies in diseased conditions of the body, rising to 106° F., or even 111° F. to 113° F., in a fever or sunstroke or heatstroke, and falling as low as 90° F. in cholera. A temperature of 108° F., if maintained for several hours, is almost inevitably fatal. But if the body be in a healthy condition, the standard of heat is maintained, even when the person is exposed to intense heat, as in the case of men attending furnaces; one can for a short time be exposed to 350° F. of dry heat without materially raising the temperature of his own body, although he will lose weight by the copious perspiration induced.

Throughout the animal kingdom the power of generating heat bears a close relation to the activity or sluggishness of the animal. Thus, many birds which are perpetually in action have the highest temperature (100° F. to 112° F.); and the swallow and quick-flighted birds higher than the fowls which keep to the ground. The higher the standard of animal heat, the less able is the animal to bear a reduction of its temperature; if that of a bird or mammal be reduced 30° F. the vital changes become slower, more languid, and death ensues. Fish and frogs, on the other hand, may be inclosed in ice and still survive.

The sources of animal heat in the living body are the chemical and physical changes continually taking place. The chemical changes are those occurring in respiration, digestion, nutrition, secretion, and muscular and nervous action. It has been shown experimentally that when those functions are performed there is an increase of temperature. It is probable that muscular action is the most important item in heat production. The ultimate sources of heat are (1) the energy locked up in the food consumed and (2) in the oxygen inhaled in respiration. The food, in the processes of digestion, is split up into its constituent parts; these are absorbed, and may become parts of the textures and fluids of the body for a time; and these textures, in the performance of their functions, disintegrate, become redissolved, and are then eliminated by various channels from the body; all of these processes generate heat.

ANIMAL MAG'NETISM. See HYPNOTISM.

ANIMAL PSYCHOL'OGY. That department of psychology (q.v.) which has for its subject matter the composition and functions of mind as it is found in animals below man. As regards its problem, one cannot question the propriety of the title; but as regards the methods which it employs, animal psychology has little in common with psychology proper. The special method of normal psychology is the method of introspection (q.v.). Modern psychology is a system of facts gleaned from the introspective reports of trained observers, working under the refinements of experimental conditions. In sharp contrast with this is the position of animal psychology; for an investigator of the animal mind has no source of first-hand evidence. Results can be obtained only by a series of inferences. The data at our disposal are simply certain movements executed by the animal. From these movements we must draw our conclusion that such and such mental processes are present or absent, using the objective as index or criterion of the subjective.

It is clear that, under such circumstances, even the most conscientious observer is liable to error. And the most obvious fallacy is that of humanizing the animal, of reading our own mind into his actions, and so of endowing him with all the forms of mental experience that are familiar to ourselves. Wundt, commenting on this attitude, cites an instance from Romanes's *Animal Intelligence*. "I have noticed," writes an English clergyman, "in one of my formicaria, a subterranean cemetery where I have seen some ants burying their dead by placing earth above them. One ant was evidently much affected, and tried to exhume the bodies; but the united exertions of the yellow sextons were more than sufficient to neutralize the effort of the disconsolate mourner." "How much," asks Wundt, "is fact, and how much imagination? It is a fact that ants carry out of their nest, deposit near by, and cover up dead bodies, just as they do anything else that is in their way. They can then pass to and fro over them without hindrance. In the observed case they were evidently interrupted in this occupation by another ant, and resisted its interference. The cemetery, the sextons, the feelings of the disconsolate mourner, which impelled her to exhume the body of the departed—all this is a fiction of the sympathetic imagination of the observer."

Sometimes, however, the observer's attitude to the animal mind is precisely the reverse: there is extreme underestimation, in place of extreme overestimation. Descartes (1596-1650), the founder of modern philosophy, after sharply distinguishing between matter and mind, body and soul, asserts that man is a composite being, a combination of soul and body, but that the animals are mere automata, all their actions and movements taking place automatically. It is plain that there can be no "animal psychology" for the Cartesians. There were, however, some among the earlier thinkers who did not deny consciousness to the lower creation. Aristotle, the "father of psychology," declared that animals exercise the functions of assimilation and reproduction, and possess a "faculty of feeling," to which is added in higher forms the capacity to retain sense-impressions, or memory. Man is distinguished from the animals by his endowment with the "faculty of knowledge" or "reason." But, at the best, animal psychology was never recognized as a worthy—or even as a possible—line of special inquiry.

The work of Darwin is admittedly the root of our present interest in animal intelligence. From the point of view of the theory of evolution, which regards not only the entire physical structure of the human body, including the nervous system, but also our entire mental structure, which stands in such intimate relation to the nervous system, as the result of a long period of development in the animal world, the close observation of the pre-human mind becomes a matter of the utmost importance. We always understand things better when we know how they have grown. Hence the psychologist has turned his attention to the problem of genesis, or the growth of mind. The problem may be attacked in two ways. We may trace the growth of mind in the individual: this is the application of the genetic method to child-study, and gives us child psychology (q.v.). Or, since man is but a highly developed animal, we may trace the growth of mind in the animal world: this is the application of the method to mind at large, and gives us comparative (or animal) psychology.

The literature of animal psychology immediately after Darwin is characterized by a mass of observations industriously collected but unfortunately not tempered by careful and conservative interpretation. There was a marked tendency to write in anecdotal vein of the doings of pet animals, and an equally marked tendency to that overestimation of animal capacity which we have mentioned above. Romanes and Lindsay may be taken as typical of this period. Recent literature attempts a more rigid application of experimental methods. The majority of present-day investigators bring their animals into the laboratory, endeavoring in this way, even at the risk of artificiality, to standardize conditions and to secure the possibility of varying at will the environmental factors which control organic life. This method of procedure finds its most obvious application in the case of those lower forms whose life history can be followed only with difficulty, if at all, in the natural state.

The reactions of micro-organisms, e.g., to mechanical, chemical, and thermal stimuli, have been studied beneath the microscope by numerous observers. And the results of investigation upon these minute unicellular forms, carried out by Gruber, Verworn, Möbius, Balbiani, and others, have had an important bearing upon that interesting and fundamental question of animal psychology, the origin of mind at large. Binet, reviewing the work of these authors, writes as follows: "If the existence of psychological phenomena in lower organisms is denied, it will be necessary to assume that these phenomena can be superadded in the course of evolution, in proportion as an organism grows more perfect and complex. Nothing could be more inconsistent with the teachings of general physiology, which shows us that all vital phenomena are already present in undifferentiated cells. Furthermore, it is interesting to note to what conclusion the admission would lead . . . that psychological properties are wanting in beings of a low order, and appear at different stages of zoölogical evolution. Romanes has minutely particularized, on a large chart, the development of the intellectual powers, but it is done in quite an arbitrary manner. According to his scheme, only protoplasmic movements and the property of excitability are present in organisms of the lower class. Memory begins with the echinoderms; the primary instincts with the larvæ of insects and the annelids; the secondary instincts with insects and spiders; and, finally, reason appears with the higher crustaceans. I do not hesitate to say that all this laborious classification is artificial in the extreme, and perfectly anomalous." For instance, "Romanes assigns the first manifestations of surprise and fear to the larvæ of insects and to the annelids. We may reply upon this point, that there is not a single infusorian that cannot be frightened, and that does not show its fear by a rapid flight through the liquid of the preparation. If a drop of acetic acid be introduced beneath the glass slide in a preparation containing a quantity of infusoria, the animals will be seen to fly at once and from all directions, like a flock of frightened sheep."

Binet's fundamental thought is probably sound; his estimation of the infusorian consciousness is probably exaggerated. Jennings, e.g., argues from a very careful study of certain of the lowest forms of life that the basis of behavior in these organisms is a limited form of the method of trial and error, with a varying admixture of tropic, i.e., stereotyped reaction. Whether the "beginnings of intelligence" observable in unicellular organisms imply mental process, he leaves undecided, though he himself inclines, apparently, to answer the question in the affirmative. This position is noteworthy for another reason, since Jennings, at an earlier stage of his work, declared that, e.g., all the activities of the paramecium can be accounted for by "simple irritability, or the property of responding to a stimulus by a fixed set of movements." Very interesting are the inferences drawn by Bethe from his study of ants and bees. We are accustomed to rank these creatures very high in the mental scale; but all Bethe's evidence goes to show that they are practically automata. Their remarkably complicated activities must, then, be regarded as purely physiological and unconscious reactions to environmental changes. A typical experiment will illustrate the nature of the evidence collected, and will serve, at the same time, to contrast the results of the experimental method with the results of simple observation. Huber, an enthusiastic observer of the habits of ants, noted that an ant which is taken from a nest and returned to it after an interval of four months is recognized and received by its former companions with all marks of friendliness. Huber considered that this was good proof of the accuracy and permanence of the ant memory. Bethe, however, took an ant from a strange nest, dipped it in a mess of impounded "home" ants, and found that the disguised stranger was received with every token of recognition and hospitality! The entire process of "recognition" is thus explicable on the ground of a chemo-reflex. We shall see presently how this and similar results are to be reconciled with those which tell strongly for the existence of mentality in the lowest forms of animal life.

Let us now turn our attention to the outcome of the experimental method as applied to higher forms, such as dogs, cats, rats, and chicks. In general, the animals are confined in cages, while appeal is made to their intelligence, ingenuity, and memory through the avenue of hunger. The results have been such as considerably to decrease our estimate of the mental capacity of the animals. Thus Thorndike, after tracing the formation of associations in the animal consciousness, remarks that his work "has rejected reason, comparison or inference, perception of similarity, and imitation. It has denied the existence in animal consciousness of any important stock of free ideas or impulses, and so has denied that animal association is homologous with the association of human psychology." A vigorous protest against this mode of interpretation has, it is true, been entered by Mills, who contends that confinement in cages is essentially an artificial and abnormal condition, that hunger is not the strongest possible means of appeal to animal intelligence, and that "it seems more probable that the mental processes of the highest animals are not radically different from those of man, so far as they go, but that the human mind has capacities in the realms both of feeling and intellection to which animals cannot attain." The general trend of opinion is, apparently, for Thorndike and against Mills; but, in face of the divergence of expert judgments, the layman will do well to hold himself in suspense, until such time as community of investigation has brought about a substantial agreement on the main points at issue. The recent publication (Kline) of a laboratory course in comparative psychology is a hopeful sign.

To return to the main problem: we have to show how the reflex and, to all appearances, wholly unconscious reactions of such forms as ants and bees are to be squared with the evidence of mentality in the protozoa, evidence which makes mind coeval with life. It seems reasonable to adopt the view which sees in impulse (the consciousness accompanying action upon presentation; see ACTION) the original and primitive type of consciousness. Now, the impulse has varied in two directions. In the first place, by the gradual effacement of its distinctively mental features, the primitive type of action has come to take the form of the reflex, a relatively simple mechanical answer to stimulation. Here we must place, if such there be, the purely tropic protozoa. In the second place, the impulsive action has, in certain forms of organic life, broadened out into selective and volitional action. In this line of development stand the higher animals, including man. Lastly, the most developed forms of action exhibit a constant tendency to become automatic; so, e.g., piano playing, bicycle riding. In other words, there is a tendency for certain phases of complex psycho-physiological activity to degenerate into activity which is simply physiological. The final outcome is, therefore, the formation of a system of reflexes which, in view of their circuitous development, we may term secondary reflexes. Ants and bees, as they appear in Bethe's pages, would then be types in which practically every vestige of a once fairly complicated mental structure has disappeared, to make way for an elaborate series of secondary reflexes. Thorndike has even argued, in similar vein, that the present anthropoid apes may be mentally degenerate; that their chattering is possibly "a relic of something like language," and not a first attempt at language-making.

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ANIMALS, CRUELTY TO. See CRUELTY TO ANIMALS.

ANIMAL WOR'SHIP. See MAN, paragraph *Sophiology*.

AN'IMA MUN'DI (Lat. the soul of the world). The view that all the changes in phenomena are due to the operation of conscious beings, conceived on the analogy of human consciousness, was the result of one of the most primitive and most naïve attempts to solve the problems presented by chance and change to experience. (See MYTHOLOGY.) When the step was taken from a belief in a multiplicity of presiding genii to a single ordering consciousness, which stands in the same relation to the world as a whole as the human mind stands to the human body, the doctrine of the *anima mundi* was reached. It has been held in various forms, and has survived to quite recent times. Anaxagoras (q.v.), who believed in a universal reason that gave form to the universe, was one of the first Occidental philosophers who held this doctrine. Aristotle (q.v.) escaped animism (i.e., the doctrine of an *anima mundi*) by holding that although Nature is a being in itself alive, God is separated from nature as a transcendent spirit. In the system of the Stoics the *anima mundi* was conceived to be the sole vital force in the universe: it usurped the office of pure spirit, and the doctrine became indistinguishable from pantheism. In modern times Agrippa of Nettesheim (1486-1535) revived the doctrine with a changed terminology, substituting *spiritus mundi* for *anima mundi*. Bruno, Paracelsus, Sebastian

Franck, Boehme, Van Helmont, More, and Cudworth (see articles under these titles) have advocated similar views with varying terminology. See PANTHEISM.

ANIME, ăn′ĭ-mĕ (of disputed origin). A variety of copal; a mineral resin soluble in alcohol and used, to some extent, in the manufacture of sealing-wax and of varnishes. It is supposed to originate from the Icica icicariba, a tree indigenous to Brazil and the West Indies, and is brought into the market in the form of white, brittle sticks. In England the name anime is applied to the soft copal resins in general. See COPAL.

AN′IMISM. See MAN, paragraph *Sophiology*, and SUPERSTITION.

ANIMUCCIA, ä′nė-mōō′chȧ, GIOVANNI (c. 1500-71). An Italian musician sometimes called the "Father of the Oratorio." He became maestro di capella of the Vatican in 1555. For the congregation of the Oratory, one of whose objects it was to render religious services attractive to young people, Animuccia composed the *Laudi*, which were to be sung at the conclusion of the regular office, and from which the oratorio is said to have developed. Several of his masses, magnificats, motets, and madrigals, etc., have been published, and among these the following are a few of the most noteworthy: *Il primo libro di madrigali, etc.* (Rome, 1595); *Joannis Animucciæ Magistri Capellæ Sacrosanctæ Basilicæ Vaticanæ Missarum Libri* (Rome, 1567); *Magnificat ad Omnes Modos* (Rome, 1568); *Il secondo libro delle laudi ove si contengono motetti, etc.* (Rome, 1570).

ANIMUCCIA, PAOLO (?-1563). An Italian musician, brother of Giovanni Animuccia. He was one of the ablest contrapuntists of his time and occupied the position of maestro di capella at the church of San Giovanni in Laterano. Many of his motets and madrigals were popular.

ANIO, ä′nė-ō, modern **ANIENE**, ä′nė-ā′nȧ, or TEVERONE. A river in central Italy, 69 miles long, which rises 44 miles east of Rome in the Sabine Mountains, forms famous waterfalls at Tivoli (q.v.), and then flows freely through the Campagna into the Tiber two miles above Rome. An aqueduct was built in 265 B.C., with the proceeds of booty taken during the war with Pyrrhus, to carry water from Tivoli to Rome. The water power of the Anio is now converted into electric energy, which is transmitted to Tivoli and Rome. See AQUEDUCT.

AN′IONS. See ANODE; ELECTRO-CHEMISTRY.

AN′ISE (Lat. *anisum*, anethum, Gk. ἀν[ν]ηθον, *an[n]ethon*, anise, dill), (*Pimpinella anisum*). An annual plant of the natural order Umbelliferæ. The genus Pimpinella, which embraces about 75 species, found in nearly all lands but Australia, has compound umbels usually without involucres. Two species are natives of Great Britain; one of which, Pimpinella saxifraga, is commonly known by the name of burnet saxifrage, and has no properties of importance. Anise is a native of Egypt and other Mediterranean regions. It is an annual plant; the stem is 1½ to 2 feet high, dividing into several slender branches; the lower leaves roundish, heart-shaped, divided into three lobes, and deeply cut; those of the stem pinnate, with wedge-shaped leaflets. The umbels are large and loose, with yellowish-white flowers. It is much cultivated in southern Europe, Germany, especially in the district around Erfurt, where a large quantity of the seed is annually produced, South America, India, etc. Attempts were made more than 200 years ago to cultivate it in England, but the summers are seldom warm enough to bring it to perfection. It is occasionally sown in gardens for a garnish or for seasoning. Anise-seed is used as a condiment and in the preparation of liqueurs; also in medicine, as a stimulant stomachic, to relieve flatulence, etc., particularly in infants; and it has been used in pulmonary affections. It has an aromatic, agreeable smell and a warm, sweetish taste. It contains a volatile oil, called oil of anise, which is nearly colorless, has the odor and taste of the seed, and is employed for similar purposes. One hundredweight of seed yields about two pounds of oil, which is obtained by distillation; but at Erfurt the oil is made from the stems and leaves. Star anise, or Chinese anise, is the fruit of Illicium verum. See ILLICIUM.

AN′ISOPH′YLLY (Gk. ἀν, *an*, neg. + ἴσος, *isos*, equal + φῦλλον, *phyllon*, leaf). Plants whose leaves differ in form and size when they appear on opposite sides of horizontal or oblique stems are said to exhibit anisophylly. See LEAF.

ANJER, än′yĕr, or **ANJIÈR**, än′yĕr. A fortified seaport of Java, on the Straits of Sunda, 60 miles west of Batavia (Map: East India Islands, C 6). It is the landing place for passengers and mails for Batavia, and is frequented by steamers for a supply of fresh water and food. It was completely destroyed by a volcanic eruption in 1883, but has been rebuilt since then. Its population is estimated at 3000.

ANJOU, *Engl.* ăn′jōō; Fr. äN′zhōō′ (from *Andecavi, Andegavi*, a Gallic tribe). A former province in the northwest of France, now forming the department of Maine-et-Loire, and small parts of the departments of Indre-et-Loire, Mayenne, and Sarthe. It was inhabited in ancient times by the Andecavi, whose ancient capital bears the modern name of Angers. The most celebrated of the counts of Anjou was Geoffrey V., called Plantagenet, whose son by Matilda, daughter of Henry I. of England, ascended the English throne in 1154 as Henry II. Anjou remained in the possession of the English till 1204, when it was seized by Philip Augustus. Some forty years later it was bestowed as a fief upon Charles, the son of Louis VIII., who became by conquest in 1266 the founder of the Angevin line of Kings in Naples and Sicily. At this time for nearly half a century it was united with Provence. From 1328 to the year 1360, in which it was made a duchy, it was held by the French crown as a part of the dowry brought by Margaret of Anjou to Charles of Valois, father of Philip VI. It was reunited with Provence under the rule of the kings of Naples in 1382. In 1480, upon the death of René the Good, it was annexed to the royal dominions by Louis XI. The last who bore the title of Duke of Anjou was the grandson of Louis XIV., who became Philip V. of Spain. Consult Marchegay and Salmon, *Chroniques d' Anjou* (Paris, 1856-1871).

AN-JU. A town of northwestern Korea about 160 miles northwest of Seoul.

ANKARSTRÖM, äŋ′kär-strĕm, JOHAN JAKOB. See ANCKARSTRÖM.

ANKERITE. A carbonate of calcium, magnesium, and iron isomorphous with dolomite and siderite (q.v.) and intermediate between them in composition. It crystallizes in brownish to grayish rhombohedra closely resembling those of dolomite. It occurs chiefly in deposits of iron ore and is found in the hematite mines of Antwerp, N. Y., near Londonderry, Nova Scotia, and in the Styrian and German iron mines. It is named after Prof. Anker of Styria.

ANKLAM, än'klȧm. A town of Prussia in the province of Pomerania, 44 miles northwest of Stettin, on the right bank of the Peene, and four miles from its mouth in the Kleine Haff (Map: Prussia, E 2). The river is navigable to Anklam, which has long been commercially important. It was at one time an important fortress, but in 1762 its fortifications were dismantled. Many of its private houses are excellent samples of German mediæval architecture. It has manufactures of linens and woolens, breweries, soap works, and tanneries, and ship yards. Anklam was settled by Germans in the twelfth century, and joined the Hanseatic League in 1244. During the wars of the seventeenth and eighteenth centuries it was repeatedly sacked. In 1720 it was acquired by Prussia. Pop., 1890, 13,000; 1900, 14,600; 1905, 15,604.

ANKOBAR, än-kō'bẽr, or **ANKOBER**. A town in eastern Africa, the capital of the former Abyssinian kingdom of Shoa, situated at an altitude of over 8000 feet, in lat. 90° 34′ N. and long. 39° 53′ E. (Map: Africa, J 4). The climate is healthful. Its population is estimated at from 7000 to 10,000.

ANKO'RI or **ANKO'LE**. A plateau of the Uganda Protectorate, British East Africa, lying between lakes Albert Edward and Victoria.

ANKYLOSIS, ăŋ'kĭ-lō'sĭs (Gk. ἀγκύλωσις, *ankylōsis*, a stiffening of the joints, from ἀγκύλη, *ankylē*, the bend of an arm, a joint bent and stiffened by disease). A term used in surgery to denote a stiffness in joints, which is not dependent upon muscular rigidity. It results from disease, causing the formation of fibrous adhesions or deposit of osseous material. Osseous union may render the joint perfectly rigid, or union may continue membranous, allowing of a certain amount of motion. The elbow is especially apt to become ankylosed. In the knee or hip-joints osseous ankylosis is the preferable form, as the limb can then afford a rigid support. Joints stiff through a membranous ankylosis may be forcibly bent, and the bond of union ruptured, so as to restore mobility, or allow of their being placed in a convenient position. Ankylosis of the joints between the ribs and the vertebræ is common in advanced age; and there are some cases on record of universal ankylosis of all the joints. Ankylosis is caused by injury, tuberculosis, gout, rheumatism, and syphilis. Passive motion, friction, massage, douches, and forcible motion under an anæsthetic are methods of treatment.

ANKYLOSTOMIASIS, ăŋ'kĭ-lō-stō-mī'ăsĭs (Gk. ἀγκύλος, hooked, and ἀτόμα, mouth) or "Miners' Anæmia" is caused by the presence of a nematoid worm, the *ankylostomum duodenale*, which acts like a bloodsucker. The disease was discovered by Dubini in 1838. The worm is from 1-60 to 1-25 inch long, and nearly cylindrical. Its head is provided with sucking discs and hooklets. The symptoms are those of simple anæmia, with bloody diarrhœa. It attacks principally miners. The disease was epidemic among coal miners in Belgium in 1894, having been brought there by Italian laborers from the St. Gothard tunnel. Stringent measures have been adopted (1906) for its control in Belgium. Access to the body is gained through the medium of food or soiled hands. Treatment consists of killing the parasites with anthelmintics and cathartics, and then relieving the anæmia with arsenic, iron, and red bone marrow. As a prophylactic measure, all defecations should be disinfected with carbolic acid and sulphuric acid, and strict cleanliness be practised.

AN'NA (Hind. ānā). An East Indian coin, a sixteenth of a *rupee* (about 33 cents), or about two cents of United States money. It is money of account only.

AN'NA, Saint. According to tradition, the daughter of Mathan, priest of Bethlehem, and the wife of St. Joachim. After twenty-one years of barrenness, she is said to have given birth to the Virgin Mary, the mother of the Saviour. Nothing positive is known about her life; her name does not occur in the Scriptures. The first to mention her is St. Epiphanius, in the fourth century; but toward the eighth, she was widely invoked. Her body was believed to have been transferred from Palestine to Constantinople in 710 A.D., and her head to Chartres, by Louis de Blois, about 1210 A.D. Düren, in the Prussian Rhine Province, Ursitz, in the diocese of Würzburg, and other churches claim to possess remains. The Roman Catholic Church has a festival in her honor on July 26th, established in 1584; the Greek, on December 9th. In Austria, Bavaria, and other Catholic countries, this festival is one of great importance. The Fraternity of St. Anna was instituted in the thirteenth century. After the Reformation it was organized anew by the Jesuits, and in modern times has manifested some vitality in Bavaria and Catholic Switzerland. She is the patron saint of child-bearers and miners, and it was upon her that Luther called for protection when in the storm, and to her he vowed to become a monk if rescued (1505).

ANNABERG, än'nȧ-bĕrk. A town of the Kingdom of Saxony, in the district of Zwickau, on the right bank of the Sehma, 18 miles south of Chemnitz (Map: Germany, E 3). It is situated 1800 feet above the level of the sea. It has extensive manufactures of lace and of silk ribbon. Pop., 1890, about 15,000; 1905, 16,813.

ANNABERGITE. A hydrous nickel arsenate which frequently accompanies nickel and cobalt deposits. It occurs in bright, apple-green fibres and earthy crusts.

ANNA COMNE'NA (1083-1148?). Author of one of the most valuable works in the collection of the Byzantine Historians. She was the daughter of the Emperor Alexius I. (Comnenus), and was born on December 1, 1083. She received the best education that Constantinople could give, and was betrothed to the son of Michael VII. After the death of her fiancé, she married Nicephorus Briennius. During the last illness of her father, she entered into a scheme to induce him to disinherit his eldest surviving son, John, and to bestow the diadem on her husband. As a punishment, Anna, with her mother, was shut up in a convent, where she remained until the death of her brother in 1143. The date of her death is unknown, but she was still at work on her history in 1148. She entitled this work the *Alexiad.* The first two books treat of the history of the Empire from the time of Isaac Comnenus; the remaining thirteen books are devoted to the reign of Alexius. Chronologically, Anna is sometimes at fault, and she omits purposely many events; but as a whole her work has great merit. The best edition is that of Schopen and Reifferscheid, 2 volumes (Bonn, 1839-78). Consult: Chalandon, *Règne d'Alexis I.* (Paris, 1900); and Oster, *Anna Komnena* (Rastatt, 1868-71).

ANNA IVANOVNA, ăn'nȧ ė-vä'nŏv-nȧ (1693-1740). Empress of Russia. She was the second daughter of Ivan, the elder brother of Peter the Great. She was married in 1710 to the Duke of Courland, the last of his race, who died in the following year. The throne of Russia was offered to her by the Supreme Council on the death of Peter II. in 1730, on conditions which greatly limited the power of the monarchy, terms which she soon broke. Her elevation was greatly due to the intrigues of the chancellor, Ostermann, who had had the charge of her education, but who was disappointed in finding her not so grateful and tractable as he had expected. For some years, however, her rule was tolerable. Abroad, Russia fought successfully in the War of the Polish Succession. Internally the army was reformed, greater liberty was allowed to the landed gentry, and government debts were paid, though to do so the peasants were crushed down with taxes. But her paramour, Biron, a German of low extraction, for whom she had obtained the Duchy of Courland, having determined to govern the nation as well as the Empress, a sudden and deplorable change ensued. This man, a bloodthirsty and avaricious wretch, established something like a reign of terror through the land. He is said to have banished not less than 20,000 persons to Siberia; numbers were knouted, had their tongues cut out, or were broken alive on the wheel. Eleven thousand perished in this way. Prince Basil Dolgoruki and others of his family suffered the ignominy of the scaffold. At length the health of the Empress gave way. She died on October 28, 1740, and left the throne to her grand-nephew Ivan, with Biron as regent. See RUSSIA, and BIRON.

ANNA KARÉNINA, ăn'nȧ kȧ-rā'nyė-nȧ. One of Count Tolstoy's novels, which first appeared serially in a Moscow publication, from 1875 to 1878. It is a powerful study of the effects of passion upon human life, and is by many considered the author's greatest work.

ANNA KARLOVNA, ăn'nȧ kär'lŏv-nȧ, or frequently, ANNA LEOPOLDOVNA (1718-46). Regent of Russia during the minority of her son Ivan. She was the daughter of Charles Leopold, Duke of Mecklenburg, and of Catharine, sister of the Russian Empress, Anna Ivanovna (q.v.). In 1739 she married Anthony Ulric, Duke of Brunswick-Wolfenbüttel. Her son, Ivan, born August 24, 1740, was appointed by the Empress Anna Ivanovna as her successor. The Empress died in October, 1740, and Biron, whom she had made regent, was overthrown within a month. Anna Karlovna now proclaimed herself Grand Duchess and Regent of Russia; but she showed no capacity for managing the affairs of a great country, spent her time in indolent enjoyments, and resigned herself very much to the guidance of one of the ladies of her court, Julia von Mengden. A conspiracy was formed by a party desirous of raising to the throne Elizabeth, daughter of Peter the Great and Catharine, and this was accomplished on December 6, 1741. The infant Ivan was sent to the castle of Schlüsselburg, where he was afterward murdered; Anna and her husband were condemned to prison for life and conveyed to Kholmogory, on the White Sea, where she died in childbed. Her husband remained a prisoner for thirty-nine years, and died in 1780.

AN'NALS (Lat. *annales,* from *annus,* year). In the original sense, records of public events arranged year by year. In the early days of Rome, such records were kept by the priests, and known as the *annales pontificum,* or *annales maximi,* because prepared by the *pontifex maximus.* In later times, public men interested in history wrote crude chronicles of events, also known as *annales;* such annalists were Fabius Pictor and Cincius Alimentus. When Ennius (q.v.), the "father of Roman poetry," wrote the deeds of Rome in heroic verse, he called his poem *Annales;* and finally Tacitus (q.v.) thus designated his story of Rome from Tiberius to Nero.

AN'NALS OF A QUI'ET NEIGH'BORHOOD. The title of a novel by George MacDonald (1866).

ANNALS OF THE PAR'ISH. The title of a novel by the Scottish writer John Galt (1821).

ANNAM, ăn-näm' (*Nhan-nam,* Peace of the South). The central division of French Indo-China and formerly the designation of an independent empire, which included the provinces of Annam, Tongking, and Cochin China (Map: French Indo-China). It embraces the greater part of the east coast of Indo-China (washed by the South China Sea), and stretches from Cochin China on the south to Tongking on the north, its southernmost point being about lat. 10° 30′ N. and its northern extremity about lat. 20° 30′, at the delta of the Song-koi or Red River. On the west it is bounded by the country of the Laos, Siam, and Cambodia. The area is about 52,110 square miles. The much larger figures until recently current for the area have been curtailed by the organization of the French Laos country. The coast, about 750 miles long, is deeply indented and fringed with many islets.

Annam is traversed throughout its entire length from north to south by a mountain chain which slopes precipitously toward the sea, but declines gently toward the Mekong valley in the interior. It reaches in the peak of Pu-san an elevation of about 9000 feet. Pu-atuat is about 1000 feet lower. The country has two hydrographic zones. On the west is the basin of the Mekong; on the east are numerous coast rivers, shallow and nearly impracticable for navigation. The Mekong River rises in Tibet, flows through the extreme south of China, traverses the Indo-Chinese peninsula with a rapid current, gathering many tributaries on its way, and forms the boundary between Annam and Siam. It is navigated by steamboats along the Annam frontier. The largest city and the capital of Annam is Hué. The productions of Annam include rice and other cereals, cinnamon, sugar-cane, coffee, tobacco, tea, and cotton. A considerable quantity of silk is produced, and the forests yield valuable woods. The buffalo is domesticated and used in tillage. The Chinese hog is reared in large numbers. The large game characteristic of the wilds of India abounds in Annam. One of the results following on French occupation of the Laos country has been to divert trade from Bangkok in Siam to the Mekong valley and the sea coast. The first commercial caravan coming from Laos arrived at Hué in February, 1895. The principal imports are cotton goods, Chinese paper, machinery, metals, Chinese drugs, petroleum, and tea. The exports consist of sugar, cinnamon, horn, ivory, skins, raw silk, wood, etc. In 1897 the imports amounted to 4,719,349 francs and the exports to 2,552,919 francs. The principal ports of Annam are Tourane, Fai-fu, Qui-nhon and Xuan-dai.

The government is in theory a monarchy. The king is assisted by a council of six members, though everything is in reality subject to the French resident superior at Hué, who has a staff of assistants and a military guard. The country is divided into twelve provinces, each of which is subdivided into fu (departments) and huje (districts). Most of the actual administration of justice and tax collection is under the native officials. Service in the native army, of 10,000 men, who are under French officers, is compulsory. The population of Annam was 7,096,465 in 1904, including a small number of Chinese and Europeans.

The Annamese comprise at least two different stocks—the rather primitive Mois of the mountainous interior, and the Annamese proper, both of whom exhibit quite uniform physical types, notwithstanding intermixture with other peoples (Khmers, Malays, Chinese, etc.) in prehistoric and in recent times. The foreign-born population, living chiefly in the towns, comprises 4000 Chinese and 250 Europeans. The Annamese proper are short, rather slenderly built, brachycephalic, and although belonging, by reason of their monosyllabic speech, to the great group of mankind of which the Chinese are the best known representatives, possess a certain physical individuality of their own. They have a swaggering stride or gait, arising from a peculiar structure of the pelvis and femur and a notable separation of the big toe, or "foot-thumb," from the other toes. Like most of the peoples of this region, they possess strains of Aryan, and, possibly, negroid blood. Annamese culture and folk-lore are largely reflections of Chinese. From China came also their alphabet, literature, and the form of Buddhism and Confucianism professed by the more enlightened classes. The Annamese are essentially democratic in disposition, and live in patriarchal style, the father having almost absolute authority in his family. About 420,000 of the inhabitants are Catholics. Among the principal towns are Hué, the capital, Bindinh Vinh, Than-hoa, and Tourane.

Subjected to China, together with Tongking, in the third century B.C. by She Twang Ti, Annam became autonomous under Chinese suzerainty in 1428 A.D. after long and sanguinary wars. In 1789 the ruler of Annam was able, with French aid, to free himself from subjection to China and to join Tongking and Cochin China to his empire. This became a field of French influence. Under Napoleon III., France began the establishment of her dominion in Indo-China, by engaging in hostilities with Annam in 1858. In 1862 the King was compelled to cede the principal part of Cochin China to the French, and the rest of that territory was added in 1867. The French continued to encroach, entered in 1882 upon the conquest of Tongking (of which they became masters in 1885), and the treaty of June 6, 1884, ratified at Hué, February 23, 1886, established a French protectorate over Annam. French troops occupy the citadel of Hué, and France controls the finances. Prince Bun-Lan, who was proclaimed king in 1889, under the name of Than-Thaï, attained his majority in 1897.

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AN'NA MATIL'DA. A pseudonym under which Hannah Parkhouse Cowley maintained a poetical correspondence with Robert Merry ("Della Crusca"), the leader of the so-called English "Della Cruscans," in the *World*, ending about 1789, when the correspondents first met personally. Their interchange of verses gained an added notoriety from Gifford's satire *Baviad* and *Mæviad*, which held it up to ridicule. "Anna Matilda" has come to be a type of writer of tasteless sentimentalism.

AN'NAN. A seaport and parliamentary burgh in the county of Dumfries, Scotland, on the river of the same name, near its entrance into the Solway Firth (Map: Scotland, E 4). It is neat and well built; among the chief industries are tanning, cotton-spinning, and rope-weaving. The river is navigable for large vessels half a mile below the town. There is regular communication by steamers with Liverpool and Whitehaven, and railways connect the town with Edinburgh, Glasgow, and Carlisle. The burgh unites with Dumfries, etc., in returning one member to Parliament. Pop., royal parliamentary and municipal burgh, 1901, 5804.

AN'NANDALE. The valley of the river Annan, in Dumfriesshire, Scotland.

ANNANDALE, CHARLES (1843—). An English author. He was born in Kincardineshire, and was educated at Aberdeen University. He has edited such important works of reference as the *Imperial Dictionary* (London, 1882); *Blackie's Modern Cyclopædia* (ib., 1890); and *Student's Dictionary* (ib., 1895).

ANNANDALE, THOMAS (1838—). An English surgeon. He was born at Newcastle, and was educated at Edinburgh University, where he subsequently was appointed assistant to Professor Syme. He was for some time demonstrator of anatomy under Professor Goodsir at the same university, and in 1877 was made regius professor of clinical surgery there. He has published *Diseases and Injuries of Fingers and Toes* (1865), *Abstracts of Surgical Principles* (1868-70), and other important works.

ANNAPOLIS. The capital of Maryland, port of entry, and county seat of Anne Arundel County, on the Severn River, about 2 miles from Chesapeake Bay, 26 miles by rail south by east of Baltimore and 30 miles (direct) from Washington, D. C. It is on the Baltimore and Annapolis Short Line, and the Annapolis, Washington, and Baltimore railroads, and is connected by boat with Baltimore and other points on the bay (Map: Maryland, M 5). Among the more prominent points of interest are the Governor's

House, a fine State House, the county buildings, the United States Naval Academy (q.v.), the Marine Barracks and School of Application for Marine Officers, St. John's College, founded in 1789, and statues of Chief Justice Taney and General De Kalb. The city has a fine harbor, and is the seat of an extensive oyster-canning industry, the product being largely exported. Pop., 1890, 7640; 1900, 8525; 1905 (local est.), 7200.

In 1608 Captain John Smith visited the site of Annapolis, but no settlement was made until 1649, when a company of Puritans from Virginia established here the town of "Providence" (later changed successively to "Proctor's," "The Town," "Anne-Arundel Town," and, finally, in honor of Queen Anne, to "The Town of Annapolis"). In 1694 the capital of the province was moved hither from St. Mary's, and in 1708 (August 16), Annapolis was erected into a city. Early in the eighteenth century one of the first free schools on the continent was organized here. Out of this St. John's College (q.v.) later developed. On May 25, 1774, the citizens passed resolutions of sympathy for Boston, whose port had recently been closed, and on October 18, the brig *Peggy Stewart*, laden with tea, was publicly burned. On December 23, 1783, Washington surrendered to Congress, sitting temporarily at Annapolis, his commission as commander-in-chief. Consult: Ridgely, *Annals of Annapolis to 1812* (Baltimore, 1841); and a sketch in Powell's *Historic Towns of the Southern States* (New York, 1900).

ANNAPOLIS CONVEN'TION, The. A convention held at Annapolis, Md., September 11, 1786, to consider the question of intercolonial commerce and discuss some proposed alterations in the Articles of Confederation. Commissioners from only five States, Virginia, Delaware, Pennsylvania, New Jersey, and New York, were present (though New Hampshire, Massachusetts, Rhode Island, and North Carolina had appointed delegates, who did not attend); and the Convention accordingly adjourned after recommending that a convention of all the States be called for the purpose of rendering "the Constitution of the Federal Government adequate to the exigencies of the Union." This led to the Constitutional Convention of 1787.

ANNAPOLIS ROYAL, originally the Port Royal of the French occupation. A port of entry and summer resort in Nova Scotia, Canada, 130 miles west of Halifax, on the Dominion Atlantic Railroad, and on the Annapolis River (Map: Nova Scotia, D 5). It has an excellent harbor, navigable for ocean steamers, and an export trade in apples and lumber. The United States is represented by a consular agent. Annapolis Royal is the oldest European settlement in British North America. It was the scene of many conflicts between the French and English, and was finally ceded by the French in 1713, when its name was changed in honor of Queen Anne. The old Fort Anne has been restored by the Dominion Government and the citizens of the town, and within the fortifications a monument has been erected in memory of De Monts, who landed here in 1604. Population, 1901, 1019; 1906 (local est.), 1500.

ANN AR'BOR. A city and county seat of Washtenaw Co., Mich., 38 miles west of Detroit, on the Michigan Central and the Ann Arbor railroads, and on the Huron River (Map: Michigan, K 6). It has a fine situation amid picturesque scenery, and is the seat of the University of Michigan. (See Michigan, University of.) Its high School is well known among secondary institutions of learning, and occupies a building which, with the court house and post-office buildings, the Homeopathic Hospital and the Michigan Central Depot, is among the prominent features of the city. Ann Arbor is the centre of a fertile agricultural district, and has important manufactures of furniture, lumber products, organs and pianos, flour, carriages, etc. The government, under a revised charter of 1895, is vested in a mayor, who is elected every two years, a city council, and administrative officials, the majority of whom are appointed by the mayor, either absolutely or with the consent of the council. Ann Arbor was settled in 1824, and was incorporated as a city in 1851. Population in 1890, 9431; in 1900, 14,509; in 1904, 14,599.

ANNARR', or ONARR'. In Norse mythology, the husband of Nótt (night), and father of Jörd (the earth).

AN'NAS (Heb., merciful). A Jewish high-priest, appointed by Quirinius in 6 A.D., and deposed by Valerius Gratus in 15 A.D. He, no doubt, continued to exercise great influence, as the office was held by five of his sons, Eleazar, Jonathan, Theophilus, Avan, and Matthias, and by his son-in-law, Joseph, surnamed Caiaphas, between 18 A.D. and 36 A.D. The wealth of "the house of Annas" was to some extent derived from the booths, where they provided all kinds of materials for sacrifice. By this monopoly they made the temple "a den of robbers," and drew down upon themselves the curses of the Pharisees as well as the indignation of Jesus. The influential position of Annas may have led to the erroneous statement of Luke, that there were two high-priests, Annas and Caiaphas (iii: 2), and the consequent Johannine account of a separate trial of Jesus, before Annas (xviii : 13-27). A son of Annas, by the same name, was appointed high-priest by Agrippa II. in 62 A.D. He is said to have put to death James, the brother of Jesus; but the passage of Josephus (*Ant.* xx : 9) which relates this is probably a Christian interpolation.

ANNATES, ăn'nâts, or First Fruits. In ecclesiastical law, the value of every spiritual living for a whole year (hence the name, from the Lat. *annus*, a year), which the Pope, claiming the disposition of every spiritual benefice within Christendom, reserved out of every living. This impost was at first only levied from persons appointed to bishoprics; but it was afterward extended to the inferior clergy. The value of these annates was calculated according to a rate made under the direction of Pope Innocent IV. (1253 A.D.), but which was afterward increased by Pope Nicholas III. (1292 A.D.). The valuation of Pope Nicholas is still preserved in the exchequer. This Papal exaction was abolished by the Act 25 Henry VIII. c. 20, and by an act passed in the following year of the same reign (26 Henry VIII. c. 3), the right to annates, or first fruits, was annexed to the crown. The various statutes subsequently passed on this subject have all been consolidated by an act (1 Vict. c. 20) regulating the collection of the moneys so levied. See First Fruits; Queen Anne's Bounty.

ANNATTO, ăn-năt'tō. See Arnotto.

ANNE (ăn) of Austria (1601-66). The daughter of Philip III. of Spain, who in 1615 became the wife of Louis XIII. of France. The marriage was so far from being a happy one that the royal pair lived for twenty-three years in a state of virtual separation—a result due chiefly to the influence of Cardinal Richelieu, whose fixed determination to humble the house of Austria led him to spare no means for alienating the affection of Louis by representing her as ever involved in conspiracies against his authority. Her imprudence, however, lent much force to Richelieu's accusations, for she certainly was concerned, in some degree, in the conspiracies of Chalais (1628) and Cinq Mars (1642). On the death of the King, in 1643, Anne became Queen Regent for her son Louis XIV., and evinced her discernment by choosing as her minister Cardinal Mazarin, whom she is said to have married secretly, and by whose able management the young king (Louis XIV.) came into possession of a throne firmly established on the ruins of contending parties. (See Fronde.) Her character was marked by contradictions. Her stately coldness, which failed to attract her husband, often gave way to fits of reckless gayety which repelled him. Without being actually treasonable, she often engaged in intrigue. Proud of her royal state, she made an Italian *parvenu* her favorite, and, as some say, her husband. There was in her always a great conflict between the woman and the queen. Consult: Freer, *Married Life of Anne of Austria* (London, 1865); *Regency of Anne of Austria* (London, 1866); Matteville, *Memoirs of Anne of Austria and her Court* (New York, 1901).

ANNE of Brittany (1476-1514), Queen of France. She was the daughter and heiress of Francis II., Duke of Brittany. By her marriage to Charles VIII., December 6, 1491, Brittany became incorporated with France. Anne had been affianced to Maximilian of Austria, but the French king took care not to let slip so rich a prize. During Charles VIII.'s campaigns in Italy she governed France well. After her husband's death she married his successor, Louis XII., over whom she had great influence. She was a woman of great beauty and intelligence.

ANNE of Cleves, klēvz (1517-57). The daughter of John, Duke of Cleves, and fourth queen of Henry VIII. of England, who reluctantly married her on January 6, 1540, to conciliate the German Protestant princes, but divorced her on July 9th of the same year on no other apparent grounds than her plain looks and alleged incompatibility. She died at Chelsea, July 16, 1557. Consult the *Gentleman's Magazine*, vol. ccxc. (London, 1901), and Hume, *The Wives of Henry VIII.* (London and New York, 1905).

ANNE of Denmark (1574-1612). The wife of James I. of England (q.v.), to whom she was married at Opslo, Norway, November 23, 1589. She was born at Skanderborg, Jutland. Her marriage dowry was the Orkney and Shetland Islands. She was exceedingly fond of display, her principal aim being to outshine the other women of the court. She is said to have favored Catholicism, but she did not openly identify herself with that Church.

ANNE of Geierstein, gī′ĕr-stīn. The title of a novel by Scott (1829), based upon events connected with the victory of the Swiss over Charles the Bold of Burgundy in the fifteenth century.

ANNE, ăn, Queen of Great Britain and Ireland (1665-1714). The last British sovereign of the house of Stuart. She was born at St. James's Palace, London, February 6, 1665, and was the second daughter of the Duke of York, afterward James II., by his first wife, Anne Hyde, the daughter of the Earl of Clarendon. When she was about seven years of age, her mother died, and her father soon after professed himself a member of the Church of Rome; but he permitted his daughters to be educated in the principles of the Church of England, for which Anne always retained an ardent if not a very enlightened attachment. To advance his own popularity, her father gave her in marriage, in 1683, to Prince George of Denmark, brother of Christian V., an indolent and good-natured man, who concerned himself little about public affairs, and was endowed with no capacity for taking part in them. Anne's own weakness of character and that of her husband gave opportunity to Lady Churchill, afterward Duchess of Marlborough, her early playfellow, to acquire an influence over her which, during many years, was almost supreme. During the reign of her father, Anne lived in retirement, taking no part in politics. On the landing of the Prince of Orange, she seems at first to have hesitated, and even to have been inclined to adhere to the cause of her father, whose favorite daughter she was; but Churchill had made up his mind to an opposite course, and his wife induced the Princess to adopt it. She consented to the act by which the throne was secured to the Prince of Orange in the event of his surviving her sister Mary; but quarreled with her sister about questions of etiquette, and was afterward drawn into intrigues, in which the Churchills were engaged, for the restoration of her father, or to secure the succession of the throne to his son. Although she had borne seventeen children, only one, the Duke of Gloucester, survived infancy, to die in 1700, in his eleventh year; and Anne was without a direct heir when she ascended the throne on March 19, 1702. The influence of Marlborough and his wife was powerfully felt in all public affairs during the greater part of her reign. The strife of parties was violent, and political complications were increased by the Queen's anxiety to secure the succession to her brother. In so far as she had any political principles, they were opposed to that constitutional liberty of which her own occupancy of the throne was a sort of symbol, and were favorable to absolute government and the assertion of royal prerogative according to the traditions of her family. These principles, and her family attachment, tended to alienate her from the Marlboroughs, whose policy, from the time of her accession, had become adverse to Jacobitism, and who now, along with Godolphin, were at the head of the Whig party. The Duchess also offended the Queen by presuming too boldly and haughtily upon the power which she had so long possessed.

Anne found a new favorite in Mrs. Masham, a relative of the Duchess, who had introduced her into the royal household. To Mrs. Masham's influence the change of government in 1710 was in a great measure owing, when the Whigs were cast out, and the Tories came into office, Harley (afterward Earl of Oxford) and St. John (Lord Bolingbroke) becoming the leaders of the ministry. But although they concurred more or less in the Queen's design to secure the succession of the throne to her brother, the new ministers had quarrels among themselves which prevented its successful prosecution; their plans and intrigues became sufficiently known to alarm the nation, and to alienate many political supporters of the Government party. A dispute between Oxford and Mrs. Masham, carried on for hours in the Queen's presence and terminating in her demand for his instant resignation, seems to have brought on the attack of apoplexy of which she died, August 1, 1714. The Elector of Hanover succeeded her as George I. The principal event of her reign, the union of England and Scotland, in 1707, may be mentioned in its personal relation to herself, as she was the last sovereign who reigned over these as separate kingdoms, and the first sovereign styled "of Great Britain." Another important event was the War of the Spanish Succession, in which the Duke of Marlborough won brilliant victories over the armies of Louis XIV. of France. Queen Anne was of middle size and comely, though not beautiful. She was virtuous, conscientious, and affectionate, more worthy of esteem as a woman than of admiration as a queen. Her reign is often mentioned as a period rendered illustrious by some of the greatest names, both in literature and science, which her country has ever produced; but literature and science owed little to her active encouragement. Consult: Burton, *Reign of Queen Anne* (London, 1880): Oldmixon, *Life of Queen Anne* (London, 1716); Morris, *The Age of Anne* (New York, 1887); McCarthy, *The Reign of Queen Anne* (London, 1902).

ANNE, Sister. In the story of *Bluebeard* (q.v.), the sister of Fatima. While Fatima is awaiting the penalty of her disobedience, Anne, on the top of the tower, watches for the coming of their brothers to save them.

ANNEAL'ING (From M. Engl. *anelen*, O. F. *neeler*, Fr. *nieller*, to enamel, from Lat. *nigellus*, blackish). The process by which glass and certain metals are heated and then slowly cooled to make them more tenacious and less brittle. The rationale of annealing has been most studied, perhaps, in connection with steel manufacturing. Important steel castings are nearly always annealed, and it is a common requirement for steel forgings. In drawing steel wire, annealing is necessary at frequent intervals, and it is a common practice to anneal steel plates for the best marine boiler work. The hardening and tempering of steel are analogous processes to annealing, there being a close interrelation between the three phenomena. Steel is hardened by sudden cooling from a high temperature, usually at or above red heat, by plunging it into oil, water, etc. To temper steel means in its specific sense to mitigate, or to moderate, the effects of previous hardening. It is usually performed by gently reheating the previously hardened steel to a much lower temperature than red heat and then cooling it, generally suddenly, but sometimes slowly. While tempering somewhat moderates the effects of previous hardening, annealing aims nearly completely to eliminate them. Annealing of steel is usually effected by slow cooling from a temperature at or above red heat. Thus steel is in its hardest and most brittle state when hardened; in its softest and toughest when annealed; and in an intermediate condition when tempered.

In hardening, the steel articles, if small, are heated in boxes or pans filled with charcoal dust, and placed in reverberatory furnaces. Larger articles are heated in the furnace proper, which is often made of a special shape to fit the form of the article, such, for instance, as a long gun tube. In general, the more rapid the cooling, the harder and more brittle is the steel. Mercury is the most rapid cooling agent, and water, rapeseed oil, tallow, and coal-tar follow next in the order named. Steel castings and forgings for guns, marine engine-shafts, and armor-plate, where strength is more important than hardness, are usually cooled in oil; while steel for cutting-tools, where extreme hardness is the important thing, is ordinarily hardened in water.

In tempering hardened steel articles, they are slowly heated by contact with hot iron bars, plates or rings, on the surface of melted lead or other fusible metal, in hot sand, in burning charcoal, or in special furnaces, to a temperature of from 428° F. to 600° F. The temperature required for razors is from 446° F. to 469° F.; for shears and scissors, 491° F.; for woodworking tools, 531° F.; for swords and coiled springs, 550° F.; for handsaws, 600° F. The heated article is cooled by plunging it into a bath of water or oil.

In annealing, the article is heated uniformly in a furnace, without direct contact with the flames, to the temperature generally of bright cherry red. The common method of cooling is to withdraw the fire from the furnace and to close all apertures, allowing the furnace slowly to cool down. Cooling is sometimes accomplished by burying the heated article in ashes, lime, or other slow conductors of heat, and allowing it to become cool by the radiation of its heat. Boiler and ship plates are often cooled by simply withdrawing them from the furnace and throwing them on the mill floor to cool by radiation. When medals are repeatedly struck by the die-stamper, the gold or other metal, by the concussion, becomes brittle, and requires to be heated and annealed at intervals. Annealing is necessary in gold-beating and in rolling, hammering, and stamping sheet-metals generally. Articles of tin, lead, and zinc, which are metals with a low melting temperature, are annealed in boiling water, which is allowed to cool with the article immersed. Malleable iron is cast-iron annealed by being covered with powdered hematite ore and heated and then slowly cooled.

In the making of glass vessels by the glass-blower (see Glass), they are of course quickly reduced in temperature while the fused glass is being molded into the desired shape. The atoms of the glass thus rapidly compelled to assume a permanent position do not seem to be properly and firmly arranged together, and the vessel is very liable to be broken, either by a slight but smart blow, or a sudden increase or decrease in temperature. This brittleness is very observable in the *lacrimæ vitreæ*, or glass tears, known as Prince Rupert's drops, obtained by allowing molten glass to fall into water, when the glass forms pear-shaped drops, which are so brittle that if they be scratched with a file or the end be broken off the whole bursts asunder and falls down into a fine powder of glass. The same brittleness is exhibited in Bologna jars, or vials, which are small and very thick, and yet, if a minute angular fragment of any hard substance be dropped into the jar, the latter flies to pieces.

In the annealing of glass vessels, they are arranged in iron trays, and placed in a long oven, where they are gradually raised in temperature to near their fusing point by the trays being drawn along to the hottest part of the oven; and thereafter, the trays, with their contents, are very slowly drawn into a cooler and cooler part, till they become cold. The annealing operation generally takes twelve hours for small articles, such as wine glasses; but days, and even a week or two, are required completely to anneal large vessels. Many articles of glass, such as tubes for steam-gauges, lamp-glasses, etc., are annealed by immersion in cold water, which is very gradually raised to its boiling point, and then cooled.

The theory of annealing is one of considerable technical intricacy, and scientists are not altogether in agreement as regards many of its features. For the theory and practice of the hardening, tempering, and annealing of steel, see Howe, *Metallurgy of Steel* (New York, 1892), and Woodworth, *Hardening, Tempering, Annealing and Forging of Steel* (New York, 1903).

ANNECY, àn'sē'. A town of the department of Haute-Savoie, France (Map: France, N 6), in the midst of a fertile country at the northwestern extremity of the Lake of Annecy, and 22 miles south of Geneva. The Lake of Annecy is 1426 feet above the sea, and is surrounded by magnificent mountain scenery. It is about 9 miles long and 2 miles broad. Its waters flow by the Fieran to the Rhone. Annecy has manufactures of linens, cotton-yarn, paper, straw goods, iron, and steel-wares. Its linen bleachfields have existed since 1650. The town is clean, and has an air of respectable antiquity. The shops in many of the streets are under arcades. The most remarkable buildings are the château, once the residence of the family of Genevois-Nemours, the old and new bishops' palaces, the cathedral, and the modern church of St. Francis, the latter of which boasts of possessing the relics of St. Francis of Sales and St. Jane Frances Chantal. Annecy has a scientific and archæological museum. Pop., 1901, 13,611.

In the twelfth century, Annecy was called *Anneciacum Novum*, to distinguish it from Old Annecy, *Anneciacum Vetus*, which occupied the slopes of a neighboring hill, and was a place of some consequence in the times of the Romans. In the earlier part of the Middle Ages, Annecy belonged to the counts of Geneva, and on the extinction of that house, it passed to the house of Savoy, in whose possession it remained, except for a brief period under the French Empire, until the transference of Savoy to France in 1860.

ANNE'LIDA. See Annulata.

ANNENKOFF, ä'nyĕn-kôf, Mikhail Nikolayevitch (1835-99). A Russian soldier and engineer, born in St. Petersburg. He was educated as a member of the corps of pages, took part in crushing the Polish insurrection of 1863, and was connected with the administration of affairs in Poland until 1866. He was promoted to be colonel, and during the Franco-Prussian War accompanied the German army. In the Russo-Turkish War of 1877-78 he directed the military transportation. He became a lieutenant-general in 1878 and served in the campaign against the Tekke-Turkomans in 1880-81. He directed the construction of the railway from the Caspian Sea to Samarkand, 1881-89, and in 1892 began the construction of the line from Samarkand to Tashkent. He was also known as a chief promoter of the Trans-Siberian Railway, and published *Observations and Views of a Russian Officer* (1871).

ANNENKOFF, Nikolai Ivanovitch (1819-89). A Russian botanist. He studied at Moscow, and in 1853 became a director of the School of Agriculture. This position he occupied until 1875, when he was appointed director of the School of Horticulture at Uman. His works include a dictionary of botany, in which the names of plants are given in Russian, French, German, English, and other languages.

AN'NEXA'TION (Lat. *annexus*, a tying or binding to, from *ad*, to + *nectere*, to tie). The acquisition by a State of territory previously independent or in the possession of another power. Though strictly applicable, perhaps, only to the extension of a State's sovereignty over adjoining territory (as in the annexation of Alsace-Lorraine to Germany as the result of the Franco-Prussian War, and of California and adjacent territory to the United States as the result of the war with Mexico) the term is applied to any territorial acquisition, near or remote, as in the cession of Porto Rico and the adjacent territory to the United States, and the forcible annexation of the Boer republics in South Africa to the British Empire. Mere cession of a territory does not nullify the existing laws, until otherwise ordained, and, until possession is taken, the prior authorities retain their police functions, although, technically speaking, sovereignty ceases upon completion of cession. Thereupon the inhabitants of the annexed territory are absolved from their allegiance to their former sovereign and their legal relation to him is dissolved, but not their relations to each other. Titles to property are not affected by cession, excepting in the substitution of the new sovereign for the old as lord paramount. See Tenure.

As annexation is a legal fact, resulting in the virtual incorporation of foreign territory in the annexing State, it is not affected by such extra-legal or informal acts as discovery, occupation, or military conquest, but requires for its completion the official and legal action of the State, by treaty duly made and ratified, by proclamation of the sovereign, or by legislative act. Thus, it has been recently decided by the Supreme Court of the United States, in the so-called Insular cases (1901), that Porto Rico remained foreign territory, notwithstanding the destruction of the Spanish sovereignty and government and the occupation of the island by the military forces of the United States until the ratification of the treaty of peace with Spain in 1898, and that it was this act which extended the sovereignty of the United States over that island. Where the transfer of title is not acquiesced in by the former sovereign, there must be an effective occupation and a virtually complete destruction of the previously existing authority. But the annexation may be complete notwithstanding the active or passive opposition of the inhabitants of the territory affected, as in the case, previously referred to, of the Boers in South Africa and the native population in the Philippine Islands. See Allegiance; Colony; Conquest, and the authorities there referred to.

AN'NIE LAU'RIE. A Scottish song of the eighteenth century, by William Douglas, of Scotland, to Annie, daughter of Sir Robert Laurie, of the Maxwelton family. It was set to music by Lady Jane Scott.

ANNI′HILA′TIONISM (from Lat. *ad*, to + *nihil*, nothing). The theory of the utter extinction of man's being, both bodily and spiritual, either at death or at some later period. Little was heard of the doctrine until in the eighteenth century, when Taylor, of Norwich, England, McKnight, and a few others wrote upon it. Among later supporters perhaps Archbishop Whately may be counted; for in his *View of the Scripture Revelations Concerning a Future State*, he says that in the passages in which "death," "destruction," "eternal death," are spoken of, the words may be taken as signifying literal death, real destruction, the utter end of things; that "unquenchable fire" may mean a fire that quite consumes what it feeds upon, and the "worm that dieth not" may be that which entirely devours its prey. In the United States, the question was revived by *Six Sermons on the Question: Are the Wicked Immortal?* by George Storrs (Philadelphia, 1848). James H. McCulloh in his *Analytical Investigations Concerning the Scriptures* (Baltimore, 1852) maintained that after the final decisions at the judgment the wicked will be utterly destroyed by the visitation of God in wrath. C. F. Hudson, in *Debt and Grace, as Related to the Doctrine of a Future State* (Boston, 1857), denies that the natural immortality of the soul is even implied in the Bible; on the contrary, life and immortality are brought to the redeemed alone, all others being not only naturally mortal, soul and body, at death, but after that mortal suspension of positive existence, all are raised at the final resurrection and cast into the lake of fire at the second death. He denies that endless conscious suffering is ever affirmed to be the nature of future penalty, but affirms that the penalty consists in privation, and that in the perpetuity of this privation consists the eternity of future punishment. The Scripture terms, from which eternal misery is usually understood, such terms as "condemnation," "destruction," "perdition," "damnation," etc., he thinks express the painful and penal consignment of the entire nature to disorganization and to the complete non-existence from which it originally came. R. W. Landis replied to Hudson, in his treatise *On the Immortality of the Soul and the Final Condition of the Wicked* (New York, 1859), and many other writers discussed the subject, especially in religious reviews and magazines.

The discussion then broadened out, and was participated in by members of all communions. The general motive was to gain some relief from the thought of the eternal suffering of vast multitudes of human souls. It has accordingly been argued that sin is corrupting in its nature, that it leads necessarily to degeneration and decay, and that a sinning soul, embarked upon a course of rebellion against God, must finally wear its life-forces out and cease to be. But this position has no support in the Bible and little in reason. There is no evidence from the experience of sinners in this world, that sin, however much it may otherwise affect the nature, substantially diminishes the power of life. The tendency among thinkers, who have sought relief in this direction has therefore been rather to the doctrine of "conditional immortality," so-called, that the soul of man is not by nature immortal, but becomes so by the special gift of Christ upon the exercise of a genuine faith in him. Apart from this faith man would eventually, and probably at death, cease to be. Against the objection that thus multitudes of souls would seem to have been created to no purpose, the analogies of evolution are brought by some, by which multitudes of forms are everywhere produced that a few select ones may survive. The soul itself thus enters into the "struggle for existence," and the "fittest" souls survive; that is, those who have risen by Christian faith to the higher plane of life. The best advocate of the view is Rev. Edward White, *Life of Christ* (London, 1875). A modification of this view is to be found in S. D. McConnell's *Evolution of Immortality* (New York, 1901).

AN′NISTON. A city and the county seat of Calhoun Co., Ala., 63 miles east by north of Birmingham on the Southern and the Louisville and Nashville railroads (Map: Alabama, D 2). It has a fine location among the mountains of the Blue Ridge, and contains a park, fair grounds, the handsome churches of St. Michael and All Angels, the Parker Memorial, the Anniston College for Young Ladies, the Noble Institute, and the Barber Memorial Seminary for colored girls. The city is in a remarkably productive coal and iron, timber, and cotton region, and is the seat of an important cotton trade. There are extensive furnaces, foundries and machine shops, rolling mills, iron pipe and freight car works, locomotive and boiler works; several cotton manufacturing establishments producing a variety of goods; and manufactures of lumber products, lime, brick and tile, carriages, etc. Anniston was founded in 1873 by the Woodstock Iron Co., headed by Samuel Noble, but was not thrown open to the general public until ten years later. Pop., 1890, 9998; 1900, 9695; 1906 (local census), 18,000.

ANNOBON, ăn-nô-bôn′. An island in the Gulf of Guinea, about 1½° south of the equator, belonging to Spain (Map: Africa, E 5). It has an area of a little over six square miles, and is highly mountainous. Inhabitants number 3000, mostly black, and some of them converted to Christianity. It was discovered by the Portuguese in 1471, and ceded to Spain in 1778.

ANNONAY, ȧn′nô′nȧ′ (anciently Lat. *Annoncum*). A picturesque town of France, in the department of Ardèche, situated at the junction of two little rivers, 37 miles south of Lyons (Map: France, L 6). It has a rugged beauty of its own, the houses and jutting rocks interspersed along steep and narrow streets. The principal buildings are the Gothic church, built in 1614, the college, the museum, and library containing more than 20,000 volumes. It carries on an active trade and industry, the chief articles of manufacture being paper, of which nearly half a million reams are produced annually, glove leather from kid skins, silk and cotton twist, and woolen cloth. A great quantity of silk is produced in the neighboring villages. The paper mills of Annonay were established by the father of the celebrated aëronauts Montgolfier, who were born here, and of whom there is a statue in the Grande Place. Pop., 1901, 17,490.

AN′NUALS. A class of handsomely illustrated collections of prose and verse, imitating the gift-books of the Germans, and intended for Christmas, New Year's, and birthday presents.

The first, the *Forget-me-not,* was published in London, in 1823, and was followed by the *Literary Souvenir;* the *Keepsake,* edited by Lady Wortley, and subsequently by the Countess of Blessington; the *Book of Beauty;* the *Musical Bijou*; the *Comic Annual,* begun by Thomas Hood and others, and in the United States by the *Gift* and the *Token,* to mention a few of the many. Large sums were spent on these publications and large profits were realized; but while many authors of distinction, as Tennyson, were induced to contribute to them, the articles, as a rule, were of an inferior and highly sentimental nature, and after 1840 the demand for annuals declined. The *Forget-me-not* had an unparalleled life of twenty-two years; but the *Book of Beauty* and the *Keepsake* survived it, the last named ceasing to exist in 1856. The tradition of the old annuals survives in the special Christmas numbers of many magazines.

ANNUALS, or **MON'OCYC'LIC PLANTS.** Plants whose life cycle is completed within a single vegetative period. They are most characteristic of dry and waste places. See DURATION; and STEMS.

ANNU'ITY (from Lat. *annus,* year). A sum of money paid annually. If perpetual, the right to receive the payment passes from the annuitant to his heirs. Such perpetual annuities are less frequent than life annuities, which may assume the most varied forms. In the simplest phase of the matter the annuitant receives a fixed annual payment during his life, the annuity being extinguished by his death. If upon the lives of several persons, the aggregate amount of the annuity only is fixed. On the death of one of the recipients, his share is distributed among the survivors, the last person receiving the whole amount which was formerly distributed. The annuity may begin immediately and stop upon the happening of some contingency, as marriage; or again, the annuity may not begin until a later date, in which case it is designated as deferred. Many other combinations can be and actually are devised. Such annuities arise either from testamentary dispositions or from contract. In the former case it is the desire of the testator to insure to the recipient an income fixed in amount either for life or for a lesser period. Thus, a father may provide an annuity for his daughter, to be terminated upon marriage. In case of an annuity resting upon contract, the annuitant or some one for him, surrenders the use of a sum of money to another person who agrees to make fixed annual payments to the annuitant during the life of the latter. The annuity may be purchased by a single payment or a series of payments extending over a number of years. The latter is particularly applied to old age insurance, the object of which is to secure a fixed annual income after reaching a certain age. Such a contract between two individuals would be little more than a wager. No one can tell how long an individual may live, and one of the parties to the contract must gain at the expense of the other. When, however, the business is concentrated so that the party paying the annuities deals with a large number of persons, the same laws that make life insurance possible make this a calculable and legitimate enterprise. The relations of life insurance and annuities are obvious. They are reciprocals of one another. In life insurance a series of annual payments obtains for the insured certain capital at death, while in annuities the surrender of a certain capital insures a series of annual payments during life. Annuities are, in fact, older than life insurance, and the latter is an offshoot of the former.

The elements in the calculation of the rates of annuities are the same as in life insurance, though the calculation is a different one. The first element is the probability of human life, as determined by vital statistics. Upon the length of human life depends the number of payments, and for a given capital, therefore, the amount of such payments. It is obvious that the sum of $1000 would purchase a larger annuity for a man of fifty than for one of twenty-five. It is equally clear that for a series of contracts once entered upon, a lengthening of the average period of human life would cause pecuniary loss to those paying the annuities, while a shortening of human life would cause a profit. Like results have frequently followed from undertaking annuity contracts upon an erroneous statistical basis. The second element in the case is the interest upon money. If the money surrendered at the outset were locked up in a strong box, the calculation of the payment for a fixed number of years would be simplicity itself. In that case an annuity of $1 for ten years could not be purchased for less than $10. But the purchase money is, in fact, placed at interest, and under the terms of the contract above noted, the seller of the annuity would enjoy the interest on $10 for one year, on $9 for the second year, and so on. The purchaser, however, will not surrender his entire claim to interest, but will at least share it with the seller. It follows, therefore, that an annuity of $1 for ten years should be purchased for something less than $10. How much less, will depend upon the rate of interest. If interest were six per cent., the annuity could be purchased more cheaply than if it were only three per cent. Changes in the rate of interest complicate the practical problem of executing annuity contracts.

Such contractual annuities as have been described are more frequent in Europe than in the United States. In Europe, the earliest public debts were in the form of life annuities. The ill success of these ventures was one of the earliest stimulants to a scientific study of the laws of mortality. In European countries the issue of annuities is still carried on by the Government as well as by private companies. The greater familiarity with annuities which prevails in England, for instance, explains the frequent allusions to the interest on the public debt as a multitude of perpetual annuities. The repayment of the principal not being contemplated, the investor in the funds acquires the right to receive a certain annual income, and this right is transferable to his heirs. Annuities are assuming new importance in the United States, owing to the fact that most life insurance companies are beginning to issue new and attractive forms of annuity policies.

The mathematical treatment of the subject is extensive, involving the preparation of mortality and investment tables. The formation of these tables is discussed in the *Assurance Magazine,* a journal of the Institute of Actuaries of Great Britain and Ireland.

The annuity may be chargeable only to the person of the grantor, or it may be a charge on specific personal or real estate. In either case, if given with words of inheritance, it will descend as real property, but for all other purposes it will be treated as personal property. In this respect it differs from a rent charge (q.v.), with which it is often confused, but which is always charged on specific real estate and, whether inheritable or not, is always treated as real property. Annuities are classed by Blackstone (*Commentaries*, Book ii., p. 40) with rents, franchises, etc., as incorporeal hereditaments (q.v.). Like other species of property, they are generally alienable, except in jurisdictions where by statute beneficiaries of trusts for the payment of annuities are not allowed to alienate their interests under the trust.

Consult: Blackstone, *Commentaries on the Laws of England;* Kent, *Commentaries on American Law,* and the authorities referred to under the title INSURANCE.

AN'NULAR ECLIPSE. See ECLIPSE.

AN'NULA'RIA (Lat. *annulus*, a small ring). A genus of fossil plants found in rocks of Devonian, Carboniferous, and Permian ages, allied to the modern Equisetaceæ, or Scouring-rushes, and consisting of fluted annulated stems bearing numerous narrow leaves arranged in whorls at the ring-like joints. Annulariæ, for so long a time considered to be plants of a distinct genus, are now known to be, together with the genera Asterophyllites and Sphenophyllum, merely heteromorphous leaves of the Calamites (q.v.).

AN'NULA'TA, or **ANNELI'DA** (Lat. *annulus*, a little ring). A phylum of animals, the annelids, comprising a large group of segmented, worm-like forms, mostly included by Linnæus in his class Vermes. They have a more or less elongated body, which is always composed of numerous segments. The first of these assumes, in many, the character of a head, but in some the head is not clearly set off from the trunk. They have no jointed appendages, but most of them are provided with bristles and hairs, called *setæ*, often in numerous bundles, which are of use to them in locomotion; some, which want these, are furnished with suckers at the extremities, and employ them for this purpose; some remain fixed in one place. Their bodies are always soft, and without external or internal skeleton; but some of them form for themselves a calcareous covering by exudation; others form coverings partly by exudation and partly by agglutination. Their blood is generally red, but not from red corpuscles, as in vertebrates; sometimes it is greenish or yellowish. The circulatory system is well-developed in most annelids, though a few aberrant forms have it greatly reduced or even entirely wanting. It is generally what is called a closed system; that is, the vessels of which it is composed are entirely shut off from communication with the body cavity. But in the leeches there is no sharp distinction between blood-vessels and body cavity. There are always longitudinal vessels, usually two, sometimes four, the dorsal or lateral of which pulsate more or less. These longitudinal vessels are connected by a large number of transverse vessels. Some of these near the anterior end of the body are occasionally larger than the rest, and are called "hearts," but there is no true heart. See ALIMENTARY SYSTEM; CIRCULATORY SYSTEM.

The nervous system consists of a pair of ganglia lying above the œsophagus, known as the brain, from which the nerve trunks arise. Usually there are two such trunks, which pass downward and backward around the œsophagus, meeting in the mid-ventral line and running backward to the rear of the body as a double cord. On this there are ganglia in each segment. The sense of touch is usually acute in annelids, and is often localized in tentacles and papillæ. Many species have eyes more or less highly organized; some have sensory pits, supposed to be smelling organs; some have sensory papillæ, which from their occurrence around the mouth are supposed to be organs of taste; and a very few have otocysts, or positional organs. In all annelids, except a few aberrant forms, excretion takes place by means of nephridia, and these are usually arranged a pair in each segment. These nephridia are coiled tubes, one end widened to form a funnel and opening in the body cavity, and the other opening to the exterior. See NERVOUS SYSTEM.

Respiration is either by gills, which are of very various structure and appearance, or through the surface of the body or some part of the alimentary canal. The latter varies greatly with the habits of the worms, but the anal opening is always at the posterior end of the body. The muscular system is usually well developed, for many of these worms are very active animals. The sexes are generally separate, but many annelids are hermaphrodites. Nearly all lay eggs, and these are sometimes provided with a shell. See RESPIRATORY SYSTEM; GILLS; MUSCULAR SYSTEM.

Annelids are widely distributed over the world; while the majority are marine, a large number are found in fresh water or in the earth. Many are carnivorous, but some are almost wholly vegetable feeders. Some are sluggish, but the majority are active, and some move with remarkable rapidity. They vary greatly in size, some being almost microscopic, while others are several feet long. They are usually dull-colored, but some, especially tropical species, are gorgeously arrayed. Aside from the part they play in the economy of nature as soil producers and scavengers, they are of little use to man. Leeches were formerly (and are still sometimes) used in medicine for blood-letting, and a few species are used as food by savages, notably the palolo-worm (q.v.).

The classification of the annelids has always been a matter of great difficulty, as there are several other groups to which they seem to be related or which they superficially resemble. The matter is not definitely settled, but it seems best now to regard them as a phylum, or type, coordinate with Mollusca, Arthropoda, etc., and containing two well-marked classes, and two others whose relationships are very obscure. The largest and most important of these classes is that of the *Chætopoda*, in which the blood system is closed and the external rings of the body correspond to the internal segments. They have locomotive organs in the form of *setæ*, or appendages provided with them. The class includes a very great number of species of widely different structure and appearance, and the most convenient, though possibly not the most natural way to divide it is into three groups, Polychæta, Oligochæta, and Myzostomida. The last named are a very small group of curious, degenerate annelids which live parasitically on crinoids. The body is flat and unsegmented, and has neither circulatory nor excretory system. The second class is *Gephyrea*, containing marine Annulata "devoid of any trace of segmentation in the adult condition, without parapodia, and either without setæ, or with only a limited number." It includes Sipunculus, Echiurus, and a few closely related forms. The third class is *Archi-annelida*, minute marine worms, faintly segmented, and represented by only two families—the Histriodrilidæ, parasitic on lobsters, and the Polygordiidæ; the larvæ of both are trochospheres. The fourth class is *Hirudinea*, the leeches, which have the blood system communicating with the body cavity, and the external rings are four or five times as numerous as the inner segments. They have no setæ and are provided with suckers. Consult Parker and Haswell, *Zoölogy* (New York, 1897). See EARTHWORM; LEECH; NEREIS; SERPULA; WORMS; FOSSIL.

AN′NULET (Lat. *annulus*, dimin. of *annus*, a ring). (1) A term in architecture for a small fillet or band in relief. The annulet is several times repeated in the molding at the base of the capital of a Doric column under the ovolo. (For illustration, see DORIC ORDER.) (2) *Annulet*, a ring, a charge in heraldry of frequent occurrence.

ANNUNCIADE, ăn-nŭn′shĭ-ăd, or **ANUNCIADA**, ȧ-nōōn′thȧ-ä′Dȧ (Sp. *Anunciada*, annunciation). The name of several religious orders. (1) The religious Order of the Heavenly Annunciation, or of the Nuns of the Annunciation of Mary, was instituted by Maria Victoria Fornari at Genoa in 1604, after a very strict rule. The convents of the order at one time numbered fifty in France, Germany, and the Netherlands, but they have disappeared since the French Revolution, except the one in Genoa. (2) Another Order of the Annunciation, or of nuns of Mary's Announcement, or the Ten Virtues, was organized by Joanna, the daughter of Louis XI., in 1501, after her separation from Louis XII. It extended to fifty convents for the reception of poor gentlewomen, but was broken up at the Revolution. (3) The order of Knights of the Annunciation in Savoy, *Ordine Supremo dell' Annunziata*, now the first Italian Order, known originally as the Order of the Neck Chain or Collar, was instituted in 1360 by Amadeus VI., Duke of Savoy. It received statutes from Amadeus VIII., as Anti-Pope Felix V., in 1409, was renewed in 1518 under the name of the Holy Annunciation, and in 1720 was raised by Victor Amadeus to be the first order of the kingdom of Savoy. The King is always grand master. The knights, who since 1720 are not limited in number, must be of high rank, and already admitted to the Orders of St. Mauritius and St. Lazarus. They compose only one class. The decoration is a gold medal, on which is represented the Annunciation, surrounded by love-knots. It is usually worn suspended by a simple gold chain, but the proper collar or chain of the order is composed alternately of love-knots and roses. On the roses are engraved the letters F. E. R. T., which some interpret *Fortitudo ejus Rhodum tenuit*, in allusion to the defense of Rhodes by Amadeus V., and which others hold to signify *Frappes, entres, rompes tout*. Since 1680 the knights wear on the left breast a star embroidered in gold. The four officers of the order—the chancellor (always a bishop or archbishop), the secretary (usually the minister of foreign affairs), the almoner (usually the King's first almoner), and the treasurer—wear the decoration round the neck, suspended by a sky-blue ribbon, accompanied by a star on the left breast. For details of costumes, etc., see Burke's *Book of Orders of Knighthood*, p. 250, *et seq.* (4) A brotherhood of the Annunciation was established in Rome by Cardinal Turrecremata in 1460. Its primary object was to provide dowries for twelve poor girls, but it now supports four hundred girls, to whom it gives twenty-five scudi apiece if they marry, or fifty scudi apiece if they enter a convent. Pope Urban VIII. (died 1644) left his entire private fortune (30,000 scudi) to the brotherhood.

ANNUN′CIA′TION, THE (Lat. *ad*, to + *nuntius*, messenger, newsbearer). The announcement by the angel to the Virgin Mary of the incarnation of Christ (Luke i : 26-38). The festival of the Annunciation is kept on March 25, which was for a long period the beginning of the legal year in England. The earliest evidence of the celebration of this feast is in a canon of the Council of Toledo, held in 656. With a view to natural fitness, the framers of the Church calendar placed the festival of Christ's nativity nine months after the Annunciation.

ANNUNCIATION, THE. A subject frequently treated by religious painters. The Virgin is commonly represented with needlework, or with a book, according to the legends, while the archangel appears bearing a sceptre or, more commonly, a lily or an olive branch. Among well-known pictures with this title are paintings by Andrea del Sarto, in the Pitti Gallery, Florence; Fra Angelico, a fresco, in the cloisters attached to the church of San Marco, at Florence, a particularly delicate and characteristic treatment of the theme; also by the same, a work now in the museum at Madrid, painted for the San Domenico at Fiesole; Luca Signorelli, at Volterra, Italy, in a chapel of the Duomo; Titian, in the Scuola di San Rocco, at Venice; D. G. Rossetti, in the National Gallery, London, a noteworthy example of the pre-Raphaelite school, in which the Virgin is a portrait of Christina Rossetti.

ANNUNZIO, ȧn-nōōn′tsȧ-ō, GABRIELE D' (1864—). An Italian novelist and poet. He was born at Francavilla al Mare, near Pescara. In his fifteenth year, while a student at Prato, he published his first collection of verse, *Primo Vere*, followed at intervals by *In Memoriam* (1880), *Canto novo* (1882), *Intermezzo di rime* (1883), *Isaotta Guttadauro* (1886), *and L'Isotteo e la Chimera* (1890). From the appearance of his first volume he was hailed as a poet of exceptional promise, although the frankly licentious tone of many of his earlier poems provoked much censure. His first novel, *Il piacere* (translated under the title *The Child of Pleasure*), appeared in 1889, and was evidently written under the dominating influence of Maupassant and Bourget. In the main, it is a psychological study of a thorough-going egotist, whose affections are divided between two women, and who in the end ruins the life of one of them as well as his own. His next volumes, *L'innocente* (*The Intruder*, 1891), and *Giovanni Episcopo* (1892), are both powerful but gruesome stories, showing strongly the influence of the Russian school, and especially that of Tolstoy's *Kreutzer Sonata*. *Il trionfo della morte* (*The Triumph of Death*) appeared in 1894, and confirmed his reputation as a searching psychological writer, although its audacity has made it impossible to translate the volume in its entirety. About this time some of his volumes were translated into French by M. Herelle, and shortly after their appearance M. Vogüé wrote a highly eulogistic appreciation of d'Annunzio for the *Revue des Deux Mondes*, under the caption "La Renaissance latine," with the result that the young author suddenly awoke to an international reputation.

During the following years, d'Annunzio's literary ideals seemed to undergo an interesting evolution. Grouping together his earlier novels, *Il piacere*, *L'innocente*, and *Il trionfo*, as the *Romances of the Rose*, he conceived the idea of a triple trilogy, the second and third groups to be respectively known as the *Romances of the Lily* and *Romances of the Pomegranate*. The first "Romance of the Lily," *Le vergini delle rocce* ("Virgins of the Rocks"), appeared in 1896. His long-promised *Fuoco* ("Flame of Life"), the first of the 'Pomegranate' series, appeared in the autumn of 1900. It is an apotheosis of poetry, physical beauty, and sensual love. D'Annunzio also turned his attention to the drama, which it was his ambition to restore to the grandeur and unity of the classic Greek tragedy. His plays include: *Il sogno d'un mattino di primavera* (1897), *Il sogno d'un tramonto d'autunno* (1898), *La città morta* (1898), *La Gioconda* (1898), *La Gloria* (1899), *Francesca da Rimini* (1901), *La figlia di Jorio* (1904) and *La fiaccola sotto il moggio* (1905), the last two dealing with the life of his native Abruzzi and revealing a marked advance in his dramatic art. *Novelle della Pescara*, a collection of short tales modeled closely on Maupassant appeared in 1902. His later lyrical work is contained in the *Laudi*, a collection of songs to be completed in seven books dedicated to the pleiades and chanting the praises, as the full name tells "of the heavens, the sea, the earth, and the souls of heroes." Two books had appeared by 1906, in which year appeared also a volume of prose selections, *Prose scelte*. These later poems have been received with great enthusiasm in Italy, where d'Annunzio has been assigned a place in the front rank with Carducci. D'Annunzio is a firm believer in a new Renaissance—a Renaissance which will begin by "reestablishing the worship of Man," and which will "exalt and glorify above all things the beauty and power of man, the conqueror."

AN'NUS MIRAB'ILIS (Lat. wonderful year; the year of wonders). The title of a poem by Dryden (1667) on England's naval successes in the war with Holland (1666) and on the great fire of London.

ANN'VILLE. An unincorporated village in Lebanon Co., Pa., five miles west of Lebanon, the county seat; on the Philadelphia and Reading Railroad (Map: Pennsylvania, E 3). It is the seat of Lebanon Valley College (United Brethren in Christ), opened in 1866, and has manufactures of shoes, hosiery, etc. Annville was laid out in 1762, and originally was called Millerstown, in honor of its founder. Pop., 1890. 1283; 1900, about 2500.

ANO'A (native name). A genus of buffaloes, connecting them with the antelopes, and represented by the sapi-utan of Celebes (*Anoa depressicornis*), a small black wild cow of the Highlands, having low straight horns, wide at the base. See plate of BUFFALO.

AN'ODE (Gk. ἄνοδος, *anodos*, a way up, from ἀνά, *ana*, up + ὁδός, *hodos*, way). A term first used by Faraday to designate the positive terminal or conductor by which the current of a voltaic battery enters a substance, undergoing decomposition by electrolysis. The negative pole, or conductor, by which the current leaves the electrolyte, is called in the same nomenclature the *cathode* (*kata*, downward, and *hodos*). *Electrode* is the general term applied to either of these. The products of electrolysis are called *ions* (*iōn*, going). Such as go to the anode receive the name of *anions*, and those passing to the cathode, *cations*. Thus, in the decomposition of water by the passage through it of an electric current between two platinum plates, the water is the electrolyte; the platinum plate connected with the copper or carbon of the battery is the anode; and the one connected with the zinc plate, the cathode. The oxygen and hydrogen which are disengaged, are the ions, the oxygen separating at the anode forming the anions, and the hydrogen at the cathode the cations. See ELECTRICITY for a discussion of electrolysis.

AN'ODON'TA. A subdivision of fresh-water mussels of the family Unionidæ, characterized by having light, thin, smooth shells without hinge-teeth. They are abundant in both ponds and streams in America and most other countries. See plate of ABALONE, ETC.

AN'ODYNE (Gk. ἀν, *an*, priv. + ὀδύνη, *odynē*, pain). A remedy given to assuage pain. Properly, the term is applied to medicines, such as opium, which act on the nervous system, so as to diminish pain. Anodynes may induce sleep. See HYPNOTIC; ANÆSTHETIC.

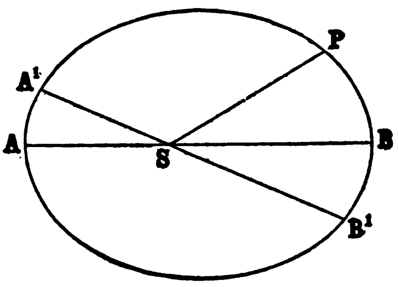
ANOINTING (Lat. *inunctio*, from *in*, in + *unguere*, to smear, anoint). The custom of pouring oil on the head, or of applying unguents to one's body. Anointing was widespread in the ancient Orient for secular as well as for religious purposes. In the Old Testament, where the custom is frequently referred to, the unguent used was olive oil, to which frequently aromatic spices were added. As a part of the regular toilet, anointing was associated with washing (e.g. Ezekiel xvi : 9), but in days of mourning, anointing, which was regarded as a symbol of joy and gladness (e.g. Psalms xxiii : 5), was omitted. Head, face, and feet were the parts of the body to which the unguents were applied. The Hebrews in thus using aromatic unguents no doubt simply followed general customs, and similarly the religious and ceremonial use of unguents was common to the ancient Orient. It was general to anoint kings as a symbol of initiation, and likewise priests and sacred objects were anointed. An interesting development growing out of the custom among the Hebrews was the use of the word *meshiach*, which means *anointed*, or "the one set aside as devoted" and sacred; and in the extension of this idea, Meshiach or Messias comes to be applied to the Hebrews as the people set aside by Jehovah, to God himself as the Messiah of his people, and to Jesus Christ as set aside by God for the redemption of mankind.

As to the original significance of anointing as a religious rite, scholars hold different views. Some regard the oil as a substitute for blood, others look upon it as itself symbolizing life, fat being, according to ancient ideas, one of the seats of life. In either case, the idea expressed by the religious and ceremonial anointing is that of establishing a covenant between the individual and the Deity, perhaps as the source of life of which the oil serves in some way or the other as representative. It was the actual rubbing of the unguent over the head, face or feet whereby direct communion between the individual and the unguent was brought about that constituted the essential part of the ceremony, and not the mere act of pouring it over the head of a person. In the course of time, however, as the custom became more and more merely a mark of honor, the pouring over the head became the customary form of anointing. In the New Testament, anointing is merely referred to in the case of the sick; but the rite was adopted by the Roman Catholic and the various Oriental churches, and survives in the anointing of kings in England, Spain, and Russia. See also CHRISM; CORONATION, and EXTREME UNCTION; and for anointing of the dead, see EMBALMING.

ANOKA, ȧ-nō′kȧ. A city, the county seat of Anoka Co., Minn., 15 miles north-northwest of Minneapolis, on the Great Northern and the Northern Pacific railroads, and on Rum River (Map: Minnesota, E 5). Anoka has a public library; and manufactures of lumber in various forms, flour, boots and shoes, starch, etc. Under a charter of 1889, the mayor is elected yearly, and the city council consists of six members. Pop., 1890, 4252; 1900, 3769; 1905, 4053.

ANO′LIS (in the Antilles, *anoli*, *anoalli*, a lizard). A genus and family (Anolidæ) of small, fine-scaled, metachroistic, iguanid lizards, numerous in the warmer parts of America, and represented in the United States by one species. See CHAMELEON. For illustration, see LIZARD.

ANOM′ALIS′TIC YEAR. The interval that elapses between two successive passages of the earth through its perihelion, or point of nearest approach to the sun. If the earth's orbit had a fixed position in space, this period would correspond with that of a sidereal revolution, or the time the earth would take after leaving any point of the heavens to return to it again, as seen from the sun; but the disturbing influence of the other planets causes the perihelion to advance slowly (11″.8 annually) in the direction of the earth's motion, so that the anomalistic year is longer (4 minutes 39 seconds) than the sidereal. This will be better understood from the accompanying diagram, in which *A′BB′* represents the elliptical orbit of the earth; *S*, the sun; *A*, the perihelion; and *AB*, the longer axis. When the earth, after leaving *A*, comes back to it again after having completed a sidereal revolution, it finds the longer axis *AB*, and with it the whole ellipse, advanced to *A′B′*, and it has still to describe an arc of 11″.8 before it reaches its second perihelion, *A′*. The length of the anomalistic year is 365 days, 6 hours, 13 minutes, 48 seconds. It receives its name from the anomaly (q.v.).



ELLIPTICAL ORBIT.

ANOM′ALISTS AND ANAL′OGISTS (for derivation, see below). Under this name were known in antiquity the representatives of the two opposing views of the origin of language. The science of grammar was developed in the Alexandrian Age, although some beginning had been made in the earlier period, notably by Aristotle. The Stoics concerned themselves with questions as to the origin of language, and maintained that it was a natural growth, while the grammarians maintained that it was the product of convention. Chrysippus (q.v.) went further and taught that language was based on difference, irregularity (*ἀνωμαλία*, *anōmalia*); the Alexandrians, Aristophanes and Aristarchus, contended that regularity, analogy (*ἀναλογία*, *analogia*), was the rule, and that all departure from regularity is to be explained as an exception to the general law. The Pergamene School of grammarians, under the leadership of Crates of Mallos, adopted the anomalistic doctrine against the analogistic teaching of the Alexandrians. When Crates was sent on an embassy to Rome in the middle of the second century B.C. he transplanted his doctrine to that city. The Alexandrians' views gained currency there somewhat later, and the contest between the two doctrines lasted a long time. Ælius Stilo, the teacher of Cicero and Varro, favored analogy; Cæsar wrote two books, *De Analogia*, now lost; and Varro devoted Books VIII.-X., still extant, of his *De Lingua Latina* to a discussion of the two views. The analogistic view finally prevailed.

Consult: Wheeler, "Analogy and the Scope of Its Application in Language," *Cornell Classical Studies* (Ithaca, 1887); Henry, *Étude sur l'analogie* (Paris, 1883); Paul, *Introduction to the Study of the History of Language*, translated and edited by Strong (London, 1888); and Strong, Logeman and Wheeler, *Introduction to the Study of the History of Language* (London, 1891), which is founded upon Paul's work. See PHILOLOGY.

ANOM′ALOUS DISPER′SION. This phenomenon will be found discussed in the article LIGHT, particularly in the section dealing with ether and matter.

ANOM′ALU′RUS. See FLYING SQUIRREL.

ANOM′ALY (Gk. *ἀνωμαλία*, *anōmalia*, irregularity, from *ἀν*, *an*, negat. + *ὁμαλός*, *homalos*, even, equal). The angle measured at the sun's centre between a planet in any point of its orbit and the last perihelion. In the figure in the article ANOMALISTIC YEAR, if *P* be a planet, *A′BB′* its orbit, *S* the sun, and *A* the perihelion, the angle *ASP* is the anomaly. It is so called because it was in it that the first irregularities of planetary motion were discovered.

ANO′NA. See CUSTARD-APPLE.

ANON′YMOUS (Gk. *ἀν*, *an*, negat. + *ὄνυμα*, *onyma*, Æol. and Dor. for *ὄνομα*, *onoma*, name). A term applied to a book the author of which does not give his name; when an assumed name is given, the term *pseudonymous* is used. Works of this class constitute one of the greatest difficulties of bibliography. French literature possesses an excellent *Dictionnaire des ouvrages anonymes et pseudonymes*, 4 volumes (third edition, Paris, 1872-79), by Barbier, embracing the titles of about 24,000 works. The best works in English are: Cushing, *Anonyms* (Cambridge, 1890), and *Initials and Pseudonyms* (first series, New York, 1885; second series, New York, 1888); Halkett and Laing, *Dictionary of Anonymous and Pseudonymous Literature*, 4 volumes (New York, 1882-88); Olphar Hamst, *Handbook of Fictitious Names* (London, 1868).

In France and Germany, literary criticism, when it extends beyond a brief notice, usually bears the author's name. In Great Britain and the United States, there is no uniform practice, though reviews are more commonly unsigned.

ANON′YMUS CUS′PINIA′NI. The Latin designation of an important anonymous manuscript, so called from the name of Joseph Cuspinianus, the scholar who brought it to notice about the beginning of the sixteenth century. It is an historical account of the quarter-century preceding the fall of the Western Roman Empire. The manuscript is in the Imperial Library at Vienna.

ANOPH′ELES (Gk. *ἀνωφελής*, *anōphelēs*, useless, harmful; from *ἀν*, *an*, priv. + *ὠφέλεια*, *ōpheleia*, help, use). A genus of mosquitoes which form the secondary hosts of malarial parasites, and communicate disease. See MOSQUITO.

AN′OPLOTHE′RIUM (Gk. *ἄνοπλος*, *anoplos*, unarmed + *θηρίον*, *thērion*, wild beast). A genus containing several species of artiodactyl mammals that lived during late Eocene and early Oligocene time in France and the British Islands, and that soon became extinct without leaving descendants. The remains of one species, *Anoplotherium commune*, of the size of a deer, occur in such abundance in the early Tertiary beds of the Paris Basin as to justify the conclusion that these animals ranged the forests of Tertiary time in immense herds in much the same manner as do the deer of the present day. The feet were provided with three digits, two of which were of equal size and of some length, while the third was in the form of a reduced dew-claw. Anoplotherium is by some authors placed in close relation to the Oreodonts, by others to the Hippopotami. See TERTIARY SYSTEM.

ANOR′THITE (Gk. *ἀν*, *an*, priv. + *ὀρθός*, *orthos*, straight; i.e., without right angles). An aluminum calcium silicate of the feldspar group of minerals. It crystallizes in the triclinic system, and is found in prismatic crystals in many rocks; it has also been recognized as a constituent of certain meteorites.

ANOR′THOSITE (Fr. *anorthose*, triclinic feldspar; see ANORTHITE). A rock of the gabbro family composed largely of that variety of feldspar, rich in lime, known as labradorite. Anorthosite has a granitoid but generally also a parallel structure, and in addition to labradorite feldspar contains often augite, hypersthene, hornblende, etc. It contains on an average about 55% of silica, 28% of alumina, 10% of calcium, 5% of soda, and 1% of potash. Under the obsolete name of labradorite rock, anorthosite has been described from the Adirondack Mountains of New York, and from southwestern Norway. It occurs also about Lake Superior. See GABBRO; LABRADORITE.

ANOS′MIA (Gk. *ἀν*, *an*, priv. + *ὀσμή*, *osmē*, smell). A medical term, denoting a loss of the sense of smell. It may be due to causes acting either on the terminals of the olfactory nerve, peripheral, or on that part of the nerve which is within the brain, central.

ANQUETIL, äɴk′tēl′, LOUIS PIERRE (1723-1806). A French historian. At the age of seventeen he joined the congregation of St. Geneviève; was director of the Seminary of Rheims, and afterward director of the College of Senlis. In the Reign of Terror he was imprisoned in St. Lazare. He was an early member of the Institute, and secured a place as archivist in the department of foreign affairs under Napoleon. His best work was his *Histoire de Reims* (1756-57). He also wrote several volumes of memoirs, such as *Louis XIV., sa cour et le régent* (1789), and an incomplete *Histoire de France depuis les Gaules jusqu'à la fin de la monarchie* (1805).

ANQUETIL DUPERRON, dṳ′pâ′rôɴ′, ABRAHAM HYACINTHE (1731-1805). A French Orientalist, born in Paris. He studied theology and Oriental languages, and in 1754 enlisted as a private soldier for India. There, after securing the support of the French Government, he passed seven years in the collection and collation of manuscripts, and studied the language and doctrines of the sacred books of the Parsees. He returned to France in 1762, was elected a member of the Academy of Inscriptions in 1763, and in 1771 published *Zend-Avesta, ouvrage de Zoroastre*, 3 volumes, the first translation of Parsee religious works ever made into a European language. His further publications include *L'Inde en rapport avec l'Europe* (1790), and *Oupnek'hat* (1804), a Latin translation of a Persian rendering of the Sanskrit *Upanishads*, noteworthy as the source of Schopenhauer's knowledge of the Indian philosophy, by which his own system was not slightly influenced.

AN′SARIES, or **ANSA′RIANS**, but more properly NOSAIRIANS. An Arab sect living in the mountains between the northern part of Lebanon and Antioch; found also in Antioch and in various places along the Syrian coast and in the interior. The origin of the sect is involved in obscurity, though it appears probable that it was founded by a certain Mohammed ibn Nosair at the close of the ninth century. The sect belongs to the so-called Shiitic branch of Islam (q.v.), and may be described as the result of the accommodation of Islam to the old Syriac heathenism. Their tenets are therefore a mixture of paganism and Mohammedanism, with some faint suggestions from Christianity, particularly in the form of Gnosticism. While their doctrines bear a resemblance to those of the Ismailitic sect, and they are clearly influenced by this sect, still they manifest an independent development of their beliefs. They divide time into seven cycles, each corresponding to an appearance of the divine spirit in some personality. Divine honors are paid to Ali and his sons, who became the representatives of the ancient deities of Syria and Phœnicia. Ali is practically the personification of the sun, and the standing formula of the religion is, "I bear witness that there is no god but Ali." They also set up a kind of trinity, associating with Ali, Mohammed and Salman-al-Farisi. The latter two are emanations of Ali, Mohammed being created by Ali, and Salman by Mohammed. Ali is designated as the "lord," Mohammed as the "veil," and Salman as the "gate." The symbol of Ali is *ma'am*, "the meaning," and the symbol of Mohammed is *ism*, "the name." This trinity is eternal, and despite the superficial resemblance of this belief to the Christian doctrine, it appears rather to be due to the transformation of the ancient local cults in Syria and Phœnicia. Salman-al-Farisi in turn created five persons, known as "the incomparable ones," who are the real creators of the world. The mystical character of their doctrines is further increased by the assumption of two worlds, an upper and a lower one, and corresponding to seven divine manifestations in each, there are seven adversaries, one appearing with each manifestation, which, moreover, consists in each case of a *ma'am*, "meaning" (representing Ali), and an *ism*, "name" (representing Mohammed). Leaving aside the seven—or, rather, fourteen—divine manifestations in the upper world, we have for the lower world as the seven manifestations of *ma'am*, Abel, Seth, Joseph, Joshua, Asaf, Peter, and Ali, and as seven manifestations of *ism*, Adam, Noah, Jacob, Moses, Solomon, Jesus, and Mohammed.

Among the populace great veneration is paid also to Khodr, a mythical personage corresponding to St. George, who delivered the country of a great monster, and in return for this and other feats the Nosairians dedicate their daughters to Khodr. Before giving them in marriage they proceed to the convent of Mar Jorjis (St. George), near Beirut, and there pay ransom money to the monks of the convent, the amount varying, according to the vow, from a third to the entire sum of the dowry.

The Nosairians believe in migration of souls, which for the faithful will be a progress in seven stages from pure to more pure, until they become stars, as they originally were; but sinners will be transformed into Jews, Christians, camels, mules, asses, dogs, and sheep. They practice circumcision and ablution, and pray in the open air three times a day. Their chief festivals are (1) Al-Gadir, falling on the eighteenth day of the month of pilgrimage, commemorating the supposed proclamation by Mohammed of Ali as his successor; (2) Fitr, "breaking of the fast," sacred to Mohammed, and the first of the festivals of the year; (3) the festival of sacrifices, sacred to Ismail, the founder of the Ismailitic sect, on the tenth day of the pilgrimage month; (4) Ashura, the tenth day of the month of Muharram, commemorating the murder of Hussein, the son of Ali; (5) al-Gadir the second, on the ninth day of the first month of Rabi', commemorating Mohammed's recognition of the mission of the sons of Ali, Hasan and Hosein; (6) Christmas, known as "the festival of the birth," on the night of the twenty-fourth of December, in memory of the birth of the Messiah, by the wife of Lazarus, daughter of Annai, according to the statement in the Koran. Besides these there are a large number of minor festivals, betraying Persian as well as Christian and old Syriac influences.

The charges of immoral practices indulged in on the occasion of their festivals are pure fabrications, due in part to the mystical character of some of their rites, particularly of those practiced at the initiation of members of the sect. Their religion inculcates benevolence, honesty, and patience. While split up into various divisions, the sub-sects differ only in matters of minor importance. Each community is governed by a chief, who is almost entirely independent. Consult Dussand, *L'Histoire et la religion des Nosarics* (Paris, 1900).

ANSBACH, ăns′bäG, or **ANSPACH** (originally Onolzbach). A town of Bavaria, capital of the circle of Middle Franconia (*Mittelfranken*), on the Rezat, 25 miles southwest of Nuremberg (Map: Germany, D 4). Its only notable buildings are the churches of St. Gumbert and St. John, and the castle, once the residence of the margraves of Ansbach, now used as a library and picture gallery. The town has several schools, a theatre, and a public slaughter house. It has manufactures of cotton and half-silken fabrics, tobacco, earthenware, playing cards, cutlery, and white lead; also a considerable trade in wool, flax, and corn. Ansbach sprang up around a Benedictine monastery founded by St. Gumbert in the eighth century. It was the capital of the principality of Ansbach, which from the close of the Middle Ages was for three centuries ruled by margraves of the Franconian branch of the House of Hohenzollern (of Brandenburg, later of Prussia). After belonging for a short time to Prussia, Ansbach and its territory, together with the old principality of Bayreuth, which had also been ruled by margraves of the Hohenzollern line and had shared the fortunes of Ansbach, were transferred by Napoleon I. to Bavaria. Pop., 1890, 14,200; 1900, 17,555; in 1905, 18,478.

ANSCHÜTZ, ăn′shụts, Heinrich (1785-1865). A German actor. He was born at Luckau, and studied at the University of Leipzig, in which city he saw the performances of Iffland, Esslair, and other distinguished actors who occasionally played there. He began his career as an actor at Nuremberg in 1807, and finally became a member of the Hofburgtheater in Vienna. He played both heroic and character parts, and was for many years the central figure at the famous playhouse with which he was so long identified. He published an autobiography under the title of *Heinrich Anschütz, Erinnerungen aus dessen Leben und Wirken* (Vienna, 1866).

ANSCHÜTZ, Karl (1815-70). A German musician. He was born in Coblentz, and in 1857 settled in New York, where he became well known chiefly as a conductor of opera and as a pioneer manager of German opera. He was also conductor of the Arion Society (1860-62).

ANSCHÜTZ, Ottomar (1846—). A German photographer, born at Lissa, in Posen. He devoted himself to instantaneous photography, and to reproducing the movements of men and animals with the aid of a "tachyscope" of his own invention. (See Stroboscope.) Anschütz's invention has been applied to useful purposes in physiology.

ANS′DELL, Richard (1815-85). An English painter of genre and animal pictures, born at Liverpool. He enjoyed a high repute both at home and abroad. The following are some of his more popular works: "Death of Sir William Lambton at Marston Moor" (1842), "Mary, Queen of Scots, Returning from the Chase" (1844), "Spanish Shepherd" (1858), "'Buy a Dog, Ma'am?'" (1860), "Treading Out the Corn" (1865), "Feeding the Goats in the Alhambra" (1871), "Home of the Red Deer" (1877), "Lucky

Dogs" (1879), "Returning from the Fair at Seville" (1882).

ANSE DE PANIER, äɴs d*e* pȧ'nyȧ' (Fr., handle of a basket). The equivalent of basket handle arch. An architectural term for three-centred arches.

AN'SELL, Mary. An English actress, who after two years of theatrical experience made a success in 1893 as Nannie O'Brien in *Walker, London.* The next year she retired from the stage to marry the author of the play, J. M. Barrie, the novelist, at Kerriemuir (July, 1894).

AN'SELM OF CAN'TERBURY, St. (1033-1109). A scholastic philosopher, born at Aosta, in Piedmont. He led at first a dissipated life, and, like Abélard, wandered through France, after the fashion of the scholars of those days, disputing wherever he could find an adversary. Attracted by the reputation of Lanfranc, he went, in 1060, to study at the monastery of Bec, in Normandy. Three years later, he became prior, and in 1078, abbot of this monastery, which under him became famous as a seat of learning. Lanfranc, who in the meantime had gone to England, and become Archbishop of Canterbury, died in 1089; and the archdiocese remained four years without a successor, till, in 1093, Anselm was appointed. He was distinguished as both a churchman and philosopher. His numerous embroilments with William Rufus and Henry I., and the unbending spirit which he displayed in these, even when subjected to banishment, indicate the vigor and resoluteness of his character, as much as his writings exhibit the depth and acuteness of his intellect. In 1720 Clement XI. expressly placed him in the list of Church authorities. Anselm was a second Augustine, superior to all his contemporaries in sagacity and dialectical skill, and equal to the most eminent in virtue and piety. Embracing without question the doctrines of the Church, mostly as stated by Augustine, and holding that belief must precede knowledge, and must be implicit and undoubting, he yet felt the necessity of a religious philosophy, urged the duty of proceeding from belief to knowledge, and sought to reduce the truths of religion into the form of a connected series of reasonings. It was for this purpose he wrote his *Monologium sive Exemplum Meditandi de Ratione Fidei.* In his *Proslogium,* otherwise entitled *Fides Quærens Intellectum* (faith seeking intellect), he strove to demonstrate the existence of God from the conception of a perfect being. This ontological proof, however, has never been held satisfactory. His writings, *Cur Deus Homo,* and *De Concordia Præscientiæ et Prædestinationis,* made an epoch in Christian philosophy. Anselm may justly be reckoned the earliest of the schoolmen, although Alexander of Hales (q.v.) was the first who completely systematized in the scholastic manner the doctrines of the Catholic Church. He died in Canterbury, April 21, 1109, and was buried there. The day of his death is observed in the Roman Catholic Church. His works are in Migne, *P. L.,* 158, 159, and a few pieces since discovered in Mai, *Nov. Bibl. I.* For his life and teachings, consult: F. R. Hasse (Leipzig, 1843-52); De Rémusat (Paris, 1858); R. W. Church (London, 1870); M. Rule (London, 1883), who also edited two lives of Anselm by Eadmer for the Rolls Series (London, 1884); J. M. Rigg (London, 1896); A. C. Welch (London, 1900). In English are his *Book of Meditations and Prayers* (London, 1872); *Cur Deus Homo,* with selections from his letters and life (London, 1889).

ANSELM OF LUC'CA. See Alexander II. (Pope).

AN'SERES (Lat. nom. plur. of *anser,* goose). An order of birds, including the ducks, geese, and swans (q.v.), and, by some systematists, the screamers, and characterized mainly by the fact that the edges of both mandibles are provided with a series of tooth-like projections, those of the upper alternating with those of the lower mandible. The Anseres are found in all parts of the world, and about two hundred species are known, mostly of large size. With few exceptions, they are essentially swimming birds, and are never found far from water. They breed near the water, lay numerous eggs, and the young are able to care for themselves almost as soon as they are hatched.

ANSGAR, äns'gär (Anskar, or Anscharius) (801-865). A French prelate, styled "the Apostle of the North," on account of his labors to introduce Christianity into Denmark, Sweden, and northern Germany. He was born near the monastery of Corbie, in the vicinity of Amiens, France. In this monastery and that of Korvei, in Westphalia, an offshoot of the former, he was educated, and in the latter he subsequently became preacher. His family belonged to the Frankish nobility, and under the patronage of Louis le Débonnaire he went, with his colleague Autbert, to preach the doctrines of Christianity among the heathen Northmen of Schleswig, where he suffered many persecutions, but had, nevertheless, such success that in 831 the Pope established an archbishopric in Hamburg, and Ansgar was appointed the first archbishop. Here he passed through many difficulties, being compelled to save his life by flight in 845, when the Northmen and Danes under Eric I. plundered Hamburg. He afterward made several missionary tours in Denmark and Sweden, and died February 3, 865, at Bremen, where a church was named after him. The Roman Catholic Church has canonized him. For his life, consult: G. H. Klippel (Bremen, 1845); Tappehorn (Münster, 1863).

AN'SON, George, Lord (1697-1762). An English admiral and famous circumnavigator. He was born at Shugborough, Staffordshire, April 23, 1697. From an early period he manifested a predilection for a sea-life, and entered the navy at the age of fifteen. In 1716 he served as second lieutenant under Norris; next under Byng in 1718, against the Spaniards; and was made a captain in 1723. In 1739, when war with Spain broke out, he was recalled from the Carolina station, on which he had been placed since 1724, and received the command of the fleet in the South Sea. He sailed from England in September, 1740, with instructions to inflict whatever injury he could on the Spanish commerce and colonies. The preparations for this cruise had been made in the most slovenly manner. Both vessels and stores were bad and the sailors were old Chelsea pensioners; yet Anson, in spite of these disadvantages, achieved a brilliant reputation by the heroism, prudence, diligence, and humanity he displayed. After his little fleet of seven vessels had been scattered by a storm in doubling Cape Horn, he landed at Juan Fernandez, where he was soon joined by three of his ships, which arrived in a dismantled condition.

While he remained on this island, he exhibited his native tenderness of character by the assiduity with which he cared for the sick. Under great disadvantages, he took several prizes, including a valuable Spanish galleon from Acapulco. Finally, with only one vessel left, he crossed the South Sea, doubled the Cape of Good Hope, and favored by good fortune, was hidden by a thick fog as he passed through the French fleet and entered the English Channel. He arrived at Spithead, June 15, 1744, and his accumulated treasure, amounting to £500,000, was landed at Portsmouth, sent up to London, and triumphantly paraded through the city in 32 wagons. He had circumnavigated the globe in three years and nine months, and his perilous cruise greatly extended the knowledge of navigation and geography. It has been described in his *Voyage Round the World* (editors Walter and Robins, 1748; new edition, 1853). As a reward for his services, Anson was made Rear-admiral of the Blue (1744), and in 1747, having defeated the French Admiral Jonquière, at Cape Finisterre, he was created Baron Soberton, and four years later first lord of the admiralty. In 1761 he was made admiral of the fleet. He died suddenly at Moor Park, Hertfordshire, June 6, 1762. Consult J. Barrow, *Life of George, Lord Anson* (London, 1839).

ANSON, G. W. (1847—). An English actor, born at Montrose, N. B. He began his career at the Theatre Royal, Edinburgh, in 1865. After touring in the provincial towns and in America, he made in 1873 his London début, in *Sour Grapes*, at the Olympic Theatre, where he was engaged for several years. In 1880, he played Gaston Rieux, in *Heartsease*, with Madame Modjeska at the Court Theatre and continued in London in various comedy parts till 1885, when he went to Australia for an extended stay. In 1892, he appeared in *The Lucky Dog* at Terry's Theatre, London. Among his subsequent rôles have been those of Schwarz, in *A Bunch of Violets*, at the Haymarket (1894); Hilarius, in *La Poupée*, with Anna Held, at the Lyric Theatre (1887), and Nero, in *Quo Vadis*, at the Adelphi (1900).

ANSO′NIA. A city in New Haven Co., Conn., 12 miles west by north of New Haven, on the Naugatuck River, and on the Berkshire and Naugatuck divisions of the New York, New Haven and Hartford Railroad (Map: Connecticut. C 4). Among the more prominent features of the city are the public library, built by Caroline Phelps Stokes as a memorial to her grandfather, Anson G. Phelps (q.v.), the founder of Ansonia, the Young Men's Christian Association Building, the Opera House, and the City Hall. Ansonia is noted as a manufacturing centre, the products including heavy machinery, rolls for paper-making and wheat-milling, rubber, sugar, copper, brass, and wire goods, electrical appliances, clocks, etc. The government, under a charter of 1901, is vested in a mayor elected every two years, a municipal council, and administrative officials, the majority of whom are appointed by the mayor with the consent of the council. Settled in 1840, Ansonia was set off from Derby in 1899, and was chartered as a city in 1893. Pop., 1890, 10,342; 1900, 12,681; 1906, (local est.) 15,000.

ANSPACH, än′späG. A town of Bavaria, Germany. See ANSBACH.

ANSPACH, or **ANSBACH,** ELIZABETH BERKELEY, MARGRAVINE OF (1750-1828). An English dramatic writer. She was a daughter of the Earl of Berkeley, and was married in 1767 to Mr., afterward Lord, Craven, but separated from him thirteen years later. In 1791, she became the wife of the Margrave of Anspach, with whom she had been some time intimately associated at his court. She and her husband were not received, when they came to England, either by her family or by royalty, even after she had been created a countess of the Empire by the German Emperor, Francis II. Her wanderings, after the Margrave's death, in 1806, finally ended at Naples, where she spent her last years. Her literary work included poetry, travels, and the plays: *Somnambule* (1778); *The Silver Tankard*, a musical farce (Haymarket, 1781); *The Princess of Georgia* (Covent Garden, 1799); and *Love in a Convent* (1805), in which she herself took part. She also wrote the curious *Memoirs of the Margravine of Anspach* (London, 1825).

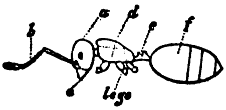
AN′STED, DAVID THOMAS (1814-80). An English geologist and mining engineer. He was born in London, and received his education at Jesus College, Cambridge. In 1840 he became professor of geology at King's College in London, and afterward occupied a similar position at the Putney College of Civil Engineering. His works include: *Geology, Introductory, Descriptive, and Practical* (two volumes, London, 1844); *Goldseeker's Manual* (London, 1849); *The Applications of Geology to the Arts and Manufactures* (London, 1865); *The World We Live In* (London, 1870); the fifth edition of his *Physical Geography* (edition 1, London, 1867) appeared in 1871.

AN′STER, JOHN (1793-1867). An Irish educator and poet. He was born in Cork County, Ireland, and was educated at Trinity College, Dublin, where he was regius professor of civil law (1850-67). He published *Poems and Translations from the German* (1819); a translation of the first part of Goethe's *Faust* (1835); *Faustus, the Second Part, from the German of Goethe* (1864); and contributions to several literary periodicals.

AN′STEY, ăn′stĭ, F. See GUTHRIE, THOMAS ANSTEY.

AN′SWER (A. S. *and-*, Ger. *ant-* in *Antwort*, answer, Gk. *ἀντί*, *anti*, against + *swerian*, to speak, swear). In law, technically the pleading interposed by the defendant to the plaintiff's bill in an action brought in a Court of Chancery. In his answer the defendant may set up any matter of defense to the plaintiff's claim, but in addition he is required to state fully under oath his knowledge or, if he has no knowledge, his information and belief as to all relevant matters alleged or inquired of in the plaintiff's bill. The method of pleading is technically known as giving discovery, and the information thus obtained may be used as evidence in the plaintiff's favor at the trial. It is subject, however, to the rule of chancery practice, that if unfavorable to the plaintiff it is conclusive unless overcome by two witnesses or by one witness and corroborative circumstances. The plaintiff, however, may avoid this consequence by expressly waiving an answer under oath in his bill. At law, as distinguished from equity, the defendant's pleading is technically known as the *plea;* but under the modern statutory system of pleading, the term answer is applied indiscriminately to the defendant's plea in either law or equity. See PLEA; PLEADING, and the authorities there referred to.

ANT (A. S. *æmete;* Ger. *Ameise;* from O. H. G. *meizan*, to cut, the original meaning thus being "cut in"; as in Gk. ἔντομος, *entomos*, Lat. *insectum*). A small hymenopterous insect of the family Formicidæ, closely related to the wasps and bees, not only in structure, but in instincts and socialistic economy. 'Emmet' is an older form of the word 'ant' still in use, and 'pismire' is another word occasionally heard. Ants are easily recognized by the well-known form of the body. The demarcation between head, thorax, and abdomen is very noticeable in these insects. From the termites and velvet ants, which most resemble them, true ants can readily be distinguished by the peculiar form of the abdomen, the first or first one or two segments of which are constricted off, to form separately jointed small knobs or scales, which greatly increase the flexibility of the body.



PARTS OF AN ANT.

a, Head; *b*, Antenna; *c*, Jaws; *d*, Thorax and Legs; *e*, pedicel; *f*, gaster.

CLASSIFICATION. The ants, according to the best authorities, form a single family, Formicidæ, divided into five subfamilies. The subfamilies are founded mainly on the condition of the peduncle or part constricted off from the abdomen (whether composed of one or two portions), and on the presence or absence of a sting.

POLYMORPHISM AND DIVISION OF LABOR. As in other social insects, there is, first of all, a dimorphism of the female sex. But among ants complexity of form goes further than this, on account of the complexity of the social organization. For the ant colony frequently contains enslaved individuals belonging to another species. The different forms of a species of ant are the results of division of labor among the members of the colony. Of the infertile females or workers, some are gatherers of food, some are nurses for the young, while others, of a larger size, act as soldiers to protect the ranks of foraging workers. In certain species certain workers serve as living storehouses. (See HONEY-MAKING ANTS.) Each of these differences in labor is associated with a difference in form. Even among individuals of the same sex and caste, considerable variability occurs. Although the workers are usually wingless, certain ones have been observed with short wings. A part or all of the fertile females may be wingless. Occasionally wingless males may exist together with the winged, while the wingless prevail in a few species.

THE ORIGIN AND MAINTENANCE OF COLONIES. Upon the appearance of the winged males and females in the ant colony, both are guarded by the workers until a suitable time for flight. Finally, they are let out on warm days in summer and autumn to appear in the air in myriads. Mating nearly always takes place while on the wing. Soon after mating, the males die and those females that escape enemies and inclement weather settle down to the ground, tear off their wings, and make excavations in materials suitable for the construction of their nest. The eggs are then laid, and upon hatching, the larvæ are fed on some substance already stored up within the body of the queen, since she never goes out for food. When the workers of the first set, which are of small size, appear, the care of the larvæ and pupæ devolves upon them, and thereafter the queen devotes herself exclusively to egg-laying. Thus a new colony is established. Frequently one or more young queens are found by workers and conveyed to colonies already established, which they continue to maintain should the former queen be old. Thus more than one queen-ant may, without quarrels, live in a single colony. The workers feed the queen, and follow her on her wanderings throughout the passages and chambers. As she lets fall the eggs, the workers carry them to suitable locations. In the queen's presence they not infrequently perform those same peculiar antics and capers which they employ to express their emotions upon the return of a lost comrade. The legless larvæ and the pupæ are carried to the surface layers by day, for the sake of the sun's warmth, and at night, or during rain, to deeper and drier chambers. The larvæ are fed by the nurses on regurgitated liquid, or on a substance elaborated by them. They are carefully licked and rubbed by the nurses to keep them clean, and when the time arrives for the pupæ to emerge from their silken or naked sheaths, the workers are at hand to help them out and to unfold and dry their wings and legs.

FOOD. As is the case with all the other labors of the colony, getting the food devolves upon the workers. All sorts of available matter, of either animal or vegetable origin, both dead and freshly killed, serve them for food, and they are fond of sweets. The nectar of flowers and the sweet saps and juices of plants and fruits are sought. Sugar is ever a temptation to them. The honey-dew excreted by plant-lice, the 'milch-cows' of ants, is especially prized. To secure it ants will climb even high trees. They follow the aphides about so as to catch the sweet excretion, and even stroke them to hasten its expulsion. When the sap supply for the aphides fails, the ants carry their 'cows' to new food-plants, and when winter comes on, both the adult plant-lice and the eggs are carried out of reach of frost into the ant caverns and carefully attended until spring, when they are again placed on the swelling plant-buds. In warm lands several kinds of ants, such as the agricultural ant (q.v.) of Texas, are said to rear, harvest, and store grain, but there is every reason to believe that this statement is based on faulty observation. This habit has been ascribed to certain American ants of the genus Pogonomyrmex, especially to the Texan harvester (*P. barbatus*), but Wheeler has shown that the circle of tall grass sometimes found around the nest of this species is not sown by the ants, but springs up from the seeds that have accidentally germinated in the nest during moist weather and have been thrown out as refuse by the insects. The Texan species is *Pogonomyrmex barbatus*. Some ants, studied by Belt in Nicaragua and by Bates in Brazil, accumulate bits of leaves within their caverns or line the walls with them. On the leaf-bits a fungus grows, or is planted, which serves the ants as food. While often very destructive to crops and stored supplies, ants such as the hunting-ants of South America, or the driver-ants of Africa, are useful scavengers; for not a bedbug, booklouse, moth, cockroach, mouse, or rat is overlooked by their myriad numbers. See DRIVER ANT; FORAGING ANT; LEAF-CUTTING ANT, and SAUBA ANT.

NESTS AND NEST BUILDING. In their nest building, ants differ from all other social Hymenoptera. The nests or combs of bees are divided into even compartments or cells, whose walls are made of wax, while those of social wasps are built of papery pulp, derived from masticated weather-worn wood. In each cell one egg is laid and one individual is reared. The young of ants, on the other hand, are kept in heaps and moved about from one part of the nest to the other as conditions of temperature and moisture demand. The nests are composed of a variable number of chambers, of irregular shape, connected by galleries. They are usually excavated in the ground, often under the shelter of a stone, or in rotting or living trees, shrubs, or herbs. The chambers and galleries which are excavated in the earth extend a considerable distance down to the region of constant moisture. Some of the sauba ants of South America are said to cross wide rivers by tunneling under the river-beds. Not infrequently the nests are carried above the level of the ground by means of earth heaped up and often cemented together. Some ant-hills are thatched by bits of herbage. In South America ant-hills often exceed the height of man. Some ants tunnel out homes in the trunks of trees, others burrow in the thorns or petioles of leaves. Certain ants make homes by bending leaves in circles. The adult ants cannot produce cement, so the larvæ nearly ready for the pupa stage are utilized. Some of the workers hold the bent edges of the leaves in place, while others bring up the larvæ, whose heads they dab back and forth over the edges of the leaves so as to bind them together with silk.

SYMBIOSIS. Although certain ants are very destructive to vegetation, the relationship between ants and certain plants is sometimes one of mutual advantage, a symbiotic one. Thus, in South America, there is a small acacia known as the bull's-horn thorn, on account of the paired, horn-shaped thorns borne on the tree. While the thorns are still young the ant pierces a hole in the tip of one of them and then makes its way through the thorn to the base, where it tunnels into the other thorn. At the base of each young bipinnate leaflet on this same tree there is a honey-secreting gland, and at the tip a minute, pear-shaped fruit. The fruit does not all ripen at the same time; hence the ants (Pseudomyrma) are kept continually running over the tender foliage in search of edible stages. When the tree is disturbed, the ants swarm out of their nests in the thorns, and by their severe sting drive off intruders, such as caterpillars and even vertebrates. But they are most valuable to the tree in warding off the leaf-cutting ants that in a few hours can defoliate a tree. In the leaf petioles of another plant (Melastoma) there are two pouches. In these ants find homes, and, in return, they keep off the leaf-cutting ants and foliage-eating foes. The young, tender leaves of certain orchids and passion-flowers have honey-glands visited by ants to the exclusion of all marauders.

RELATIONS OF DIFFERENT SPECIES TO ONE ANOTHER. Almost all kinds of ants carry off the larvæ and pupæ of other kinds of ants for food. At times, doubtless, more are taken than can be consumed; hence some of the captives come to maturity in the foreign nest. Perhaps in some such way as this, out of the instinct of the robber ant arose that of the slave-making ant. Slave-making ants, which are lighter in color than their captives, go forth in armies, attack the nests of the black ants, and carry away the larvæ and pupæ. These are brought up and act as servants or slaves. In some cases the warriors are structurally unable to take food, and hence are wholly dependent on their faithful domestics, who collect the food and actually put it in the mouths of their captors. Other small ants (Solenopsis) live the lives of thieves, secreted in small chambers excavated in the interspaces between the chambers of large ants. The small entrances to the small chambers will not admit the large ants. Hence the small thieves retreat in safety to their homes with the young of the large ant, which they take for food. With the *Formica rufa*, a smaller ant lives, apparently, in perfect harmony, perhaps as a domestic pet. When the Formicæ are obliged to move, the small form goes too, tapping antennæ with them, or even riding on the backs of their hosts. Many species of beetles, and other little creatures, are usually present in ants' nests, and seemingly on terms of friendship.

INTELLIGENCE OF ANTS. Ants are sensitive to sound-waves, even outside of human range; they are also keenly sensitive to changes in moisture and temperature. When a captive colony was placed by an experimenter near the fire, the heat was so grateful to its members, says he, that "They embraced each other, and skipped and danced like playful lambs or kittens." Many cases of ants indulging in what seems to us to be sportive exercise or play are recorded. Their care for the cleanliness of the growing young and the promptness with which they remove the dead from the nest, show a sanitary instinct. The complete and apparently willing suppression of the individual for the good of the colony almost surpasses man's comprehension of self-abnegation. The law of division of labor rules among ants. Certain groups of individuals perform only certain labors. Labor-saving devices are known to ants, for groups of workers will procure and drop food or building stuffs to waiting companions below and thus save much labor of transportation. They show ingenuity in building bridges, and may even span gaps by means of a rope made up of their own living bodies linked together. Moreover, there is little doubt in the minds of ant-observers that ants communicate with their fellows. The imparting of information seems to be done by means of the antennæ, which they cross and rub together. Ants are able to recognize the myriads of members of their own colony, including their slaves, and even those that have been taken away in infancy. All these facts and many others convince us that ants in some manner communicate with their companions. Otherwise, how are the discovery and the whereabouts of food too large for removal by one made known to the others; or how are cannibalistic and slave-making wars so managed that the whole fighting community is ready to go out simultaneously?

GEOLOGICAL ANTIQUITY. Geologically, ants are among the earliest Hymenoptera. In Tertiary times they were, perhaps, the most abundant of all the insects, and thousands of ancient forms have been found in amber.

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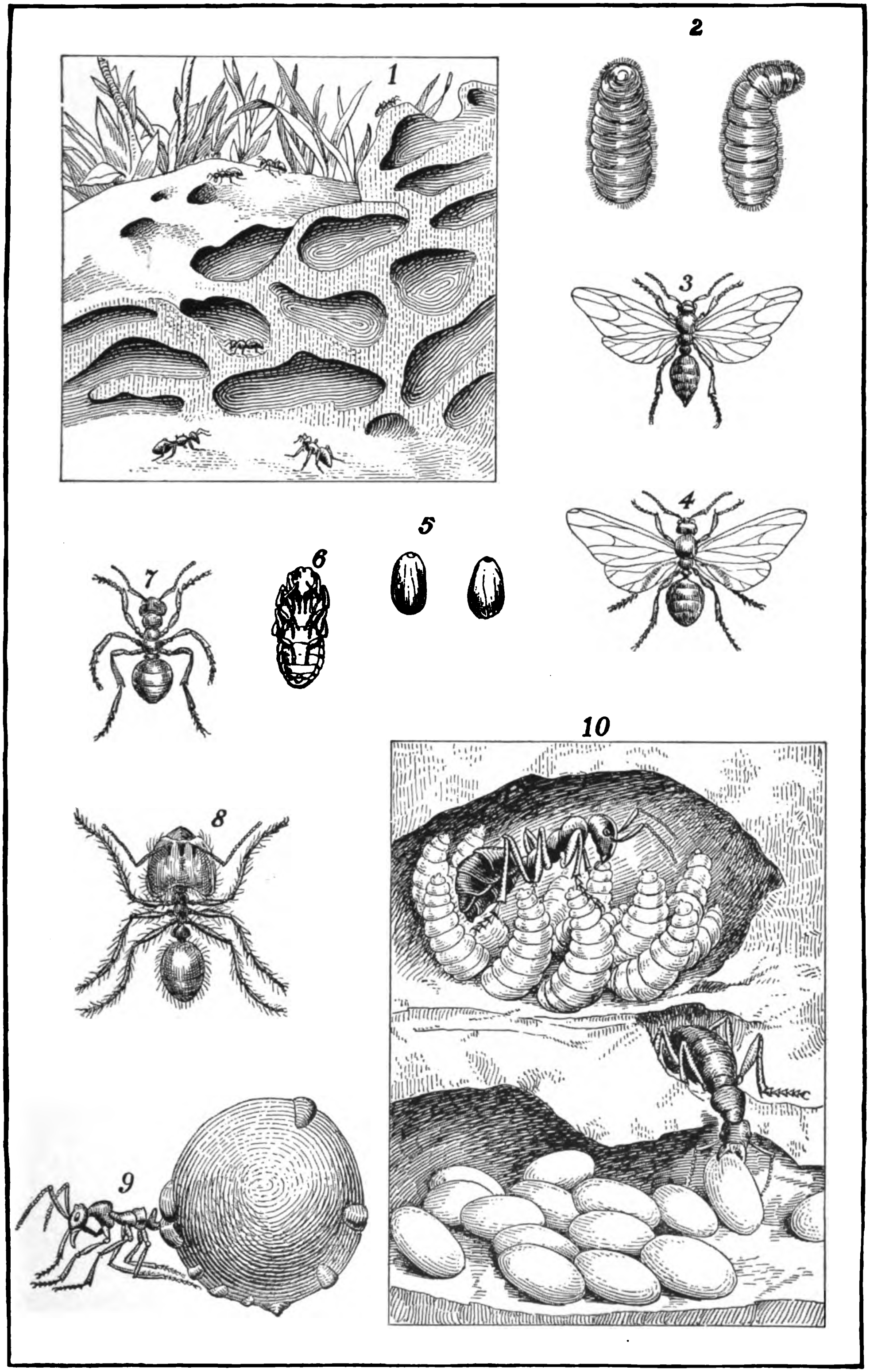
ANT



1. COLONY-NEST OF THE BLACK ANT (Lasius niger).
2. LARVA OF BLACK ANT, front and rear view (enlarged).
3. WINGED MALE OF BLACK ANT.
4. FEMALE (QUEEN) OF BLACK ANT

5-6. PUPÆ OF BLACK ANT.
7. WORKER OF THE SMALLER KIND.
8. LARGER WORKER OR "SOLDIER."
9. HONEY ANT, distended with stored honey.
10. CELLS OF BLACK ANT'S NEST, enlarged; feeding larvæ in upper cell.

VIII., pp. 257-360 (Jena, 1894-95). Lubbock, *Ants, Bees, and Wasps* (New York, 1894); White, *Ants and Their Ways* (London, 1883). For ants of the tropics, Wallace, *Tropical Nature* (London, 1878); Bates, *A Naturalist on the Amazon* (New York, 1880); Belt, *A Naturalist in Nicaragua* (London, 1888). Consult also the works of Forel, Wheeler, Wasmann, and McCook. See Insects; Aphides; Instinct, and the names of various ants. Compare Termite.

ANTACIDS, ănt-ăs'ĭdz (*ant* or *anti* + *acid*). Drugs which are employed to diminish or correct abnormal acidity in the digestive tract or the various secretions of other organs. Those which unite directly with free acid in the stomach or intestines are known as direct antacids. Examples of this class are ammonia and its carbonate. Remote antacids, such as the acetates, citrates, and tartrates of the alkalies, act by being changed into carbonates, and thus increasing the alkalinity of the blood, which in turn diminishes the acidity of the urine. Some drugs, for example, the carbonates or bicarbonates of sodium, potassium, calcium, magnesium, and lithium act as direct and also as remote antacids. The direct antacids are given after meals to neutralize an excess of the natural lactic acid of the stomach and other acids resulting from fermentation of food. Given before meals, they cause an increase of the acidity of the stomach contents by increasing the secretion of gastric juice. The remote antacids are largely employed in the treatment of rheumatism and gout.

AN'TÆ. See Pilaster.

ANTÆ'US (Gk. 'Ανταῖος, *Antaios*). A figure in legends of the Greek colonies in Africa, at first located near Cyrene, finally in Mauretania. His story is largely made up of borrowings from earlier legends. In the popular version he was a giant, son of Poseidon and Ge, who compelled all strangers to wrestle. When he was thrown, he received fresh strength from touching his mother, Earth. With the skulls of those he conquered, he built a temple to his father. He was invincible until Hercules discovered the source of his power and killed him by lifting him into the air and strangling him. Later Greek writers attempted to localize the myth in a city of Upper Egypt called Antæopolis (Egyptian name, *Du-kau;* Coptic, *Tkan*).

ANTAKIYEH, ăn'tȧ-kē'yȧ. See Antioch.

ANTAL'CIDAS (Gk. 'Ανταλκίδας, *Antalkidas*). A Spartan statesman, son of Leon. Toward the end of the year 393 B.C., he was sent by his government to Tiribazus, the Persian satrap at Sardis, to break up the understanding which then existed between Athens and Persia. He succeeded by agreeing to the Persian demand that Sparta should recognize the Persian supremacy over the Grecian cities in Asia Minor. This arrangement did not meet with the approval of King Artaxerxes, and the satrap was accordingly recalled. Shortly after, however, in 388 B.C., the King restored Tiribazus, and thereby gave evidence of his inclination toward the Spartans. Antalcidas was once more sent to Asia to treat with the Persian power, this time as admiral of the Spartan fleet. He accompanied the satrap to the Persian court, was well received, and succeeded in coming to an understanding with the King on the basis of the terms previously agreed upon. Antalcidas returned to his fleet, freed it from the blockade of the Athenians, and shut out the Athenians in their turn from the Ægean Sea. He was now in a position to compel the acceptance of terms. The peace that followed was called "The Peace of Antalcidas." In the winter of 387-386 B.C., representatives of the Greek states assembled at Sardis, where the terms of the peace were read. The final ratification took place at Sparta in 386 B.C. The terms of the peace were as follows: (1) That all the Greek towns on the mainland of Asia Minor, together with the islands Clazomenæ and Cyprus, should remain under the protection of the Persian King. (2) That all other Greek towns, large and small, should be independent; but that the islands of Lemnos, Imbros, and Scyros should, as of old, belong to Athens. (3) That war should be declared against any State that refused to accept these terms. In 372 B.C., he went for the third time to treat with the Persians, but after the battle of Leuctra (371 B.C.), he lost favor in that quarter. In 370-369 B.C., we find Antalcidas Ephor at Sparta. There is no truth in the story that he starved himself to death.

ANTANANARIVO, ăn'tȧ-nä'nȧ-rē'vō, or **TANANARIVO.** Until 1902 the capital of Madagascar, and favorably situated in the centre of the island, at an elevation of over 4000 feet (Map: Africa, J 6). It is built chiefly of wood, with irregular streets, and the most prominent building is the royal palace, situated on the summit of a hill. Its commerce, owing to its inland position and the inadequate transportation facilities, is not very extensive, but it has a considerable number of industrial establishments. The population, including over 3000 foreigners, numbered 59,551 in 1904. The natives show in their manners, as well as in their mode of life, the influence of European civilization.

ANT'ANACLA'SIS (Gk. ἀντί, *anti*, against + ἀνακλᾶν, *anaklan*, to bend back). In rhetoric, a figure in which a word is repeated in a sense different from its first use, to give additional force to the expression; as the remark of Benjamin Franklin when he was about to sign the declaration of American independence: "We must all hang together or we shall assuredly all hang separately."

ANTAR, ăn'tär, or **ANTARA**, ăn'tȧ-rä, Ibn Shaddad al-Absi. A celebrated Arabic hero of the seventh century, and one of the famous pre-Islamic poets of Arabia. His mother was a black slave, Seliba, and as the son of a slave he was also regarded as a slave, and obliged to render menial services to the members of his tribe. Through his warlike exploits, however, he secured not only his freedom, but a prominent position in his tribe. He died as a hero in battle. While neither the date of his birth nor of his death is known, he appears to have died shortly before the appearance of Mohammed, in the early part of the seventh century. He gained equal fame among the Arabs as a poet and as a hero. Of his poetical achievements, however, only one specimen has come down to us, which recounts his deeds, and sings of his love for Abla, whom he married. This poem is generally included in the collection of the choicest seven Arabic poems, known as the *Moallakat*—a name which describes those poems as "the suspended ones." A recent edition of the Arabic text is by L. Abel, *Wörterverzeichnisse zur altarabischen*

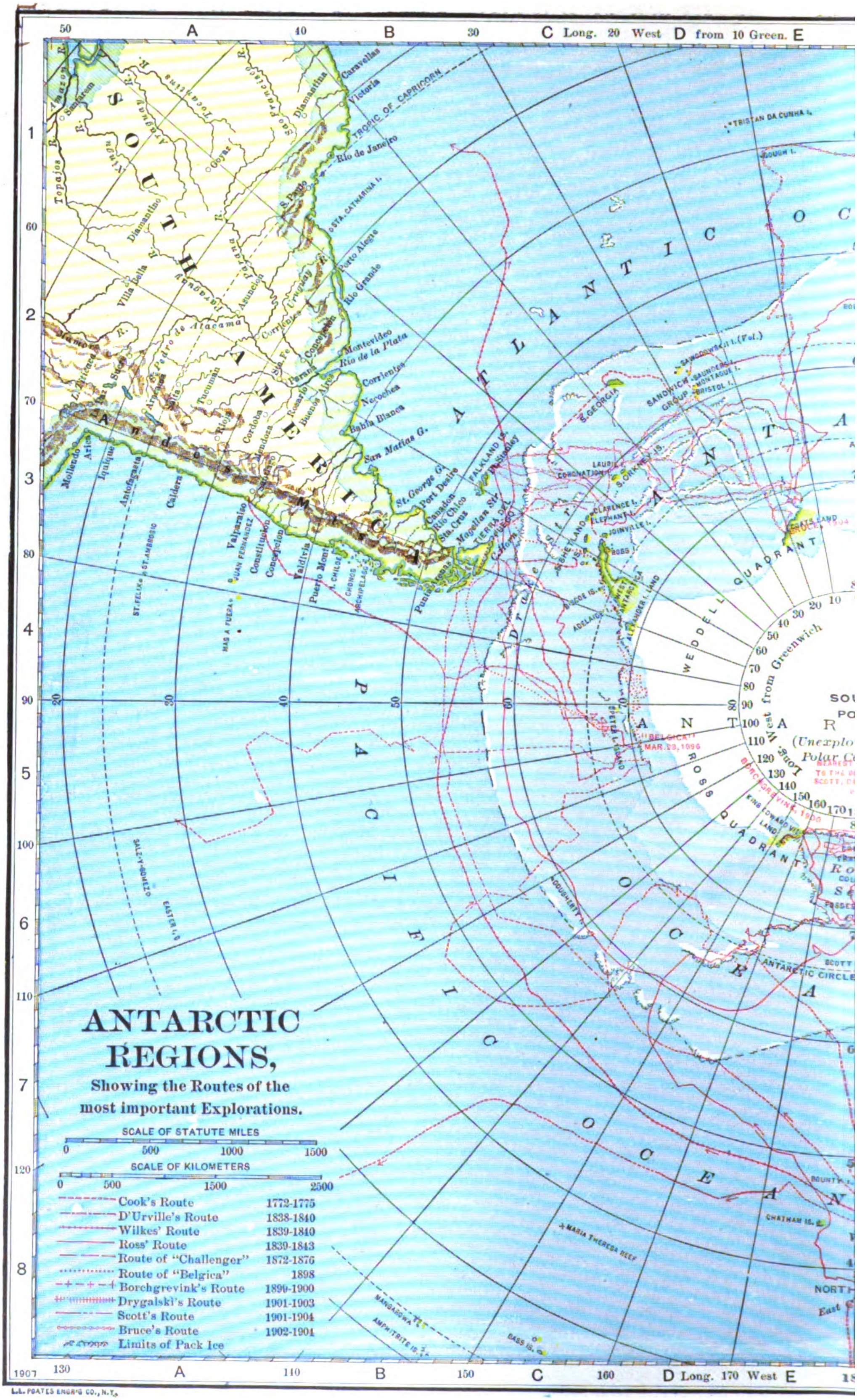
Poesie I. (Berlin, 1891); an English translation by Johnson in *Seven Arabic Poems* (London, 1897). Such was Antar's renown as a warrior that he becomes the prototype of the hero in the romantic literature of the Arabs. He is the central figure in the most famous of Arab romances, which bears the name *Antar* and is commonly ascribed to Al-Asmā‘i, who lived in the eighth century. The romance of *Antar*, however, as known to us, is a compilation which has passed through various hands, and has gradually grown to huge proportions. It gives an attractive and faithful picture of Bedouin life, and is rich in epic interest, although too monotonous to satisfy the taste of the European reader. A translation of a portion of it into English was made by Hamilton in 1820 (*Antar: A Bedouin Romance*, 4 volumes, London). A *Diwān* or collection of 28 poems is also attributed to him. The memory of Antar is also preserved in various places of the East which bear his name. Consult Goldziher, *Globus* lxiv., 65, 67, and Thorbecke, *Antarah* (Leipzig, 1867). The text has been published at Beirut and Cairo.

ANTARC′TIC CUR′RENT, Lands; Ocean. See Antarctic Region.

ANTARCTIC RE′GION (Gk. ἀντί, *anti*, against, opposite + ἄρκτος, *arktos*, bear, Ursa Major, the north). The name applied to that portion of our earth's surface which encircles the South Pole. Technically and astronomically it is bounded by the Antarctic Circle, and although the Antarctic land masses do not extend much farther equatorward than this, yet the Antarctic influences extend to very much lower latitudes, the solid ice fields drifting on nearly all sides below lat. 60° S., and between the southern extremities of Africa and South America even below lat. 50° S. The limit of this drift ice may be taken as the limit of the Antarctic region, although the drifting icebergs descend more than 10° of latitude lower. Thus, the Antarctic region is bounded by the Atlantic, Pacific, and Indian oceans. The so-called Antarctic continent lies, however, in the region of the Antarctic Circle. It is indicated, in the Eastern hemisphere, by a series of minor coast-lines which, roughly speaking, outline the circle between c. long. 180° E. and c. long. 50° E. Their names are, beginning at c. 180°, Balleny Islands, Adelie Land (c. 140° E.), Clarie Land (c. 134° E.), Sabrina Land (c. 122° E.), Knox Land (c. 105° E.), Kaiser Wilhelm II. Land (c. 90° E.), Kemp Land (c. 60° E.), Enderby Land (c. 50° E). Until 1904 a stretch of coast-line from c. 97° E. to c. 160° E. was laid down upon the maps as Wilkes Land; but certain parts of it have been shown not to exist, and other portions are doubtful. In the Western hemisphere West Antarctica (Graham Land), a long spur, with numerous outlying islands, thrusts northeastward, crossing the 70th—55th degrees of W. longitude, beyond the 63d parallel of latitude; and near the 156th meridian, W., at the 77th parallel there is another land of unknown extent, called after King Edward VII. That the area between these points is filled in with land is uncertain. It is possible that the bits of coast may be merely isolated islands, or parts of an archipelago; and there is eminent authority to support a belief in two continental masses. Between West Antarctica and King Edward VII. Land, and again, between West Antarctic and Enderby Land, the ocean extends for an unknown distance southward. In the former embayment, Weddell Sea, Bruce (1904) reported land at lat. 74° 25′, long. 18° W. There is perhaps an extensive land area at about long. 110° W. The remoteness of the Anarctic has prevented its exploration to the same extent as the north polar regions. Cooke (1773-76), Bellingshausen (1821), Weddell (1823), Ross (1842), Wilkes (1840), d'Urville (1840), the *Challenger* expedition (1874), de Gerlache (1897-98), Borchgrevinck (1899-1900), Nordenskjöld (1902-4), Drygalski (1902-3), Scott (1902-4), Charcot (1903-5), have been the chief explorers of this region. Ross reached a latitude of about 78° 10′ S. in 1842, and Scott, in 1902, pushed on to 82° 16′ 33″ S. Scott also is the only explorer who has penetrated the interior, marching more than 200 miles inland to long. 157° 30′ W. at lat. 78° S.

Antarctic Lands. The islands and possibly the continent, or continental land-masses, surrounding the South Pole. Little is known of this territory; only three of the 'Lands' have been visited by discoverers; the others have been merely sighted from a distance. Superficially all the territories have features in common—more or less lofty coast-lines (with lower islands outlying) covered heavily with snow, often to the water's edge. In many regions barriers or "terraces" of ice, sometimes two hundred feet and more above the sea level, border the land for many miles. Behind the sea cliffs, in all the regions that have been visited, there is a more or less level expanse of snow. The outlying islands are mainly of recent volcanic formation; but in those parts of the mainland which have been visited are found granites, fossiliferous sandstones, and other rocks that are characteristic of continental forms. Of the three regions which have been studied, the largest is Victoria Land, the known coast of which extends between the 160th and 170th meridians (E.), from about lat. 70° to beyond lat. 83°. Its sea wall of sandstone and granite, containing also carboniferous deposits, is nowhere less than four thousand feet high, and behind it stretches a range of mountains, with peaks rising to the height of 15,000 feet, and continuing southward to an unknown distance. Several of these peaks are extinct volcanoes, and one, Mt. Erebus (12,780 ft.), composing with Mt. Terror, Ross Island (c. lat. 77° 30′), is still active. The probability that this range, which increases in height rather than diminishes toward the south (Mt. Longstaff, the most southerly point sighted, is 15,000 feet high), does not break off suddenly, but continues, perhaps beyond the pole, furnishes evidence to those who believe that Victoria Land is the east coast of a continental mass. In Victoria Land lies the south magnetic pole.

From Ross Island to King Edward VII. Land, 400 miles, extends the façade of a mass of ice, rising almost uniformly from 200 to 300 feet above the sea. It was discovered by Ross in 1842, and called the Great Ice Barrier. Scott pushed southward for 300 miles over its comparatively level surface, and another party made a reconnaissance of 150 miles toward its centre, without coming upon any indication of its termination. Its origin remains in doubt. The coast of portions of West Antarctica (set down upon certain charts as Graham Land) is also lofty, and here, too, are found ancient crystalline rocks, and



ANTARCTIC REGIONS,

Showing the Routes of the most important Explorations.

SCALE OF STATUTE MILES
0 500 1000 1500

SCALE OF KILOMETERS
0 500 1500 2500

Cook's Route	1772-1775
D'Urville's Route	1838-1840
Wilkes' Route	1839-1840
Ross' Route	1839-1843
Route of "Challenger"	1872-1876
Route of "Belgica"	1898
Borchgrevink's Route	1899-1900
Drygalski's Route	1901-1903
Scott's Route	1901-1904
Bruce's Route	1902-1904
Limits of Pack Ice	

1907

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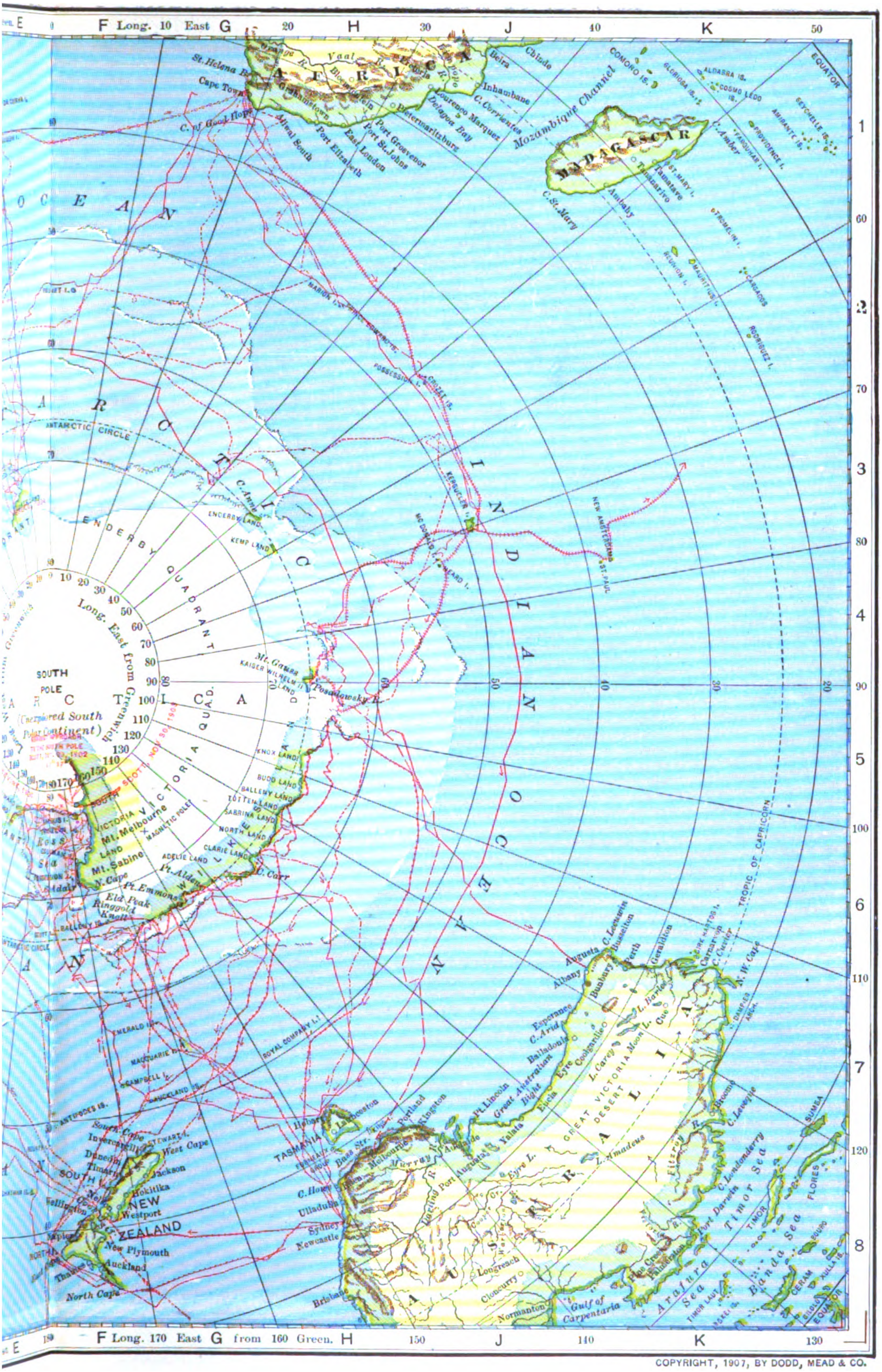

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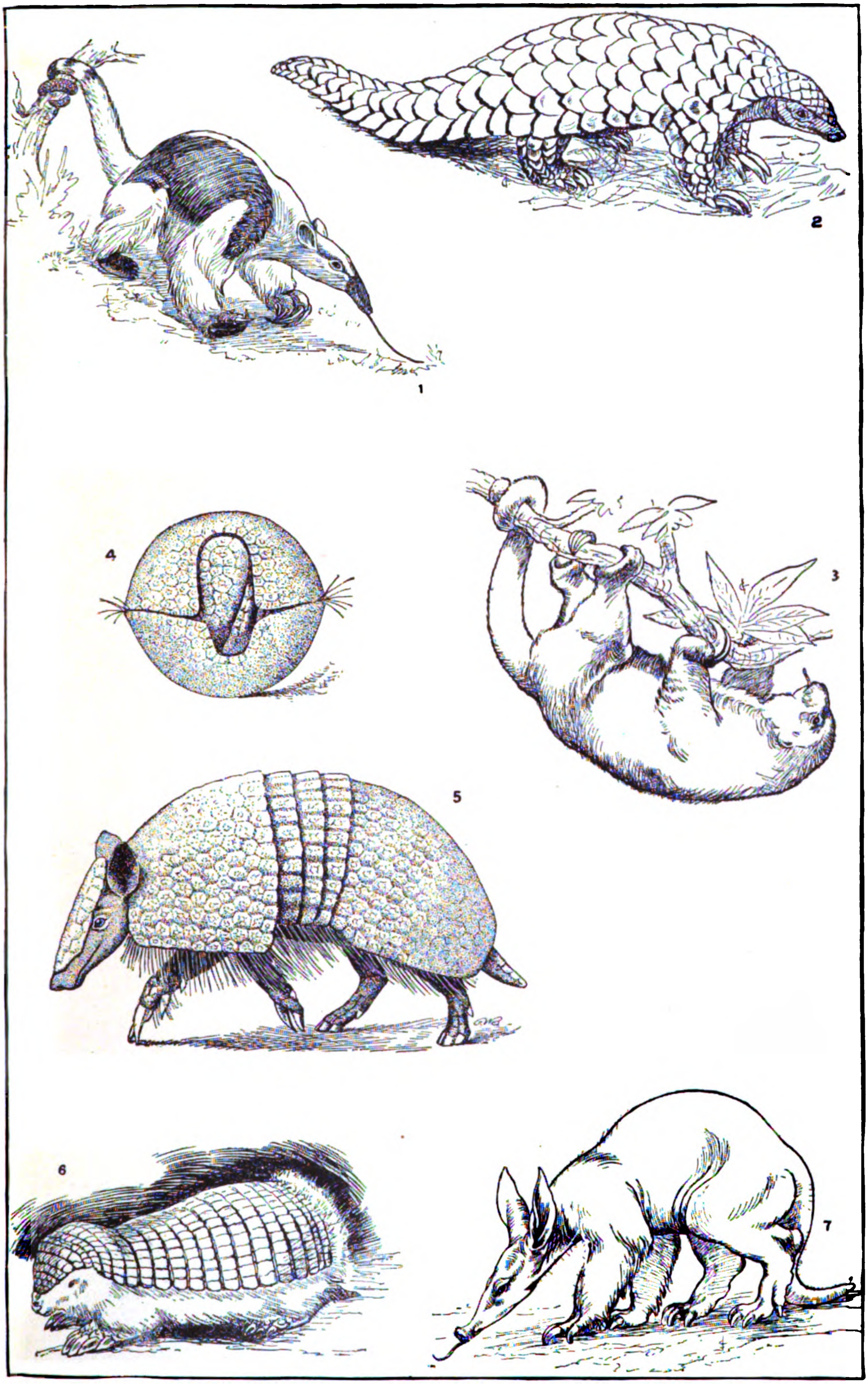
ANT-EATERS AND ARMADILLOS



1. GREAT ANT-EATER (Myrmecophaga jubata).
2. LESSER ANT-EATER (Tamandua tetradactyla).
3. TWO-TOED ANT-EATER (Cycloturus didactylus).
4-5. THREE-BANDED ARMADILLO (Tolypeutes tricinctus); walking and rolled up.
6. PICHICIAGO (Chlamydophorus truncatus).
7. AARD-VARK (Orycteropus afra).

on neighboring islands, sandstones rich in fossils. The interior, as seen from the sea, is apparently an 'ice-cap' similar to that of Greenland. The third known territory, Kaiser Wilhelm II. Land, consists of a completely snow-covered region, with one denuded peak, the Gaussberg (4000 ft.). The structure of the land is of ancient crystalline rock. Behind the Gaussberg extends a relatively level ice-plain. In the vicinity of all these lands there is a sudden rise of the sea-bottom or "continental shelf." Upon this fact the advocates of the continent theory base an argument.

ICE. The pack ice is not so formidable as it is in the Arctic regions. The sea freezes over in winter; but ordinarily, in summer, the ice breaks away from the land, and the major part of it is borne away by the prevailing winds. An outlying pack borders all regions that have been reached by explorers; but not being confined by land, as is the ice of the Arctic basin, it becomes dissipated as the season wears on, and is at no time so heavy as the northern pack.

The icebergs are probably not directly formed from glaciers, as in Greenland; the Antarctic glaciers, although of great extent, are at best very sluggish, and the larger number are receding. The bergs undoubtedly are discharged from the great ice-barriers or terraces; they are "tabular" in form and often many square miles in area.

CLIMATE. The temperatures of the Antarctic are colder in summer, and perhaps warmer in winter, than those of the far north. The coldest temperature registered upon the *Discovery* expedition was —67° F. (May, 1903). In all regions, both winter and summer, sudden storms, accompanied by blinding snow, are frequent.

FLORA. The vegetation is very sparse, consisting of tussock grass, mosses, and lichens. Of these, however, there are a number of species. Three kinds of hepaticæ have also been found.

FAUNA. No land mammals exist. A variety of birds build their nests on the beaches. Among the birds are penguins, skua, petrel, fulmar, etc. There are five varieties of seal, and upon the northern coasts sea-elephants and sea-lions are sometimes found. There are six varieties of whales and dolphins. Sea-life is exceedingly rich, including, among many other species, sponges, medusæ, echinoderms, crinoids, mollusks, nunatodes, amphipoda, cephalopods, etc. Fishes also are abundant.

ANTARCTIC OCEAN. The name Antarctic Ocean is given to the sea waters lying within the Antarctic region. Between the latitude of Cape Horn and the Anarctic lands the whole circumference of the globe presents an unbroken expanse of waters, save for a few islands here and there. The floor of the Antarctic gradually shoals from the middle latitude depths toward the South Pole. In general, at lat. 60° S., the waters of the Antarctic Ocean have an average annual temperature at the surface of 29° .8 F., which is warmer than the average temperature of the air in the same latitude (28° .7 F.). At great depths and near the ocean floor the water temperature is between 32° F. and 35° F., but between these depths and the surface there is usually found a wedge-shaped layer of water with a temperature varying from 28° F. to 32° F.

The Antarctic drift is mainly from the west on the outer border and from the southwest and south at the interior of the Antarctic region. There are two great Antarctic currents: one crosses the Antarctic circle toward the north, between long. 120° and long. 140° W., but swerves toward the east in lat. 50°, and near the South American continent separates, part going northward past Peru, and part preserving its eastward movement past Cape Horn, whence it returns to the Antarctic between long. 60° E. and 80° E.; the other current crosses the Antarctic Circle, going north between long. 80° and long. 100° E., and swerves to the eastward, forming the west Australian current.

The winds at the interior of the Antarctic region are probably directed spirally outward from the polar centre, so that they blow as southeast winds; but on the outer border winds are generally from the west, perhaps mostly from the northwest, rather than from the southwest. The annual precipitation immediately around the South Pole is probably less than 10 inches, but this increases to about 25 inches on the outer boundary of the Antarctic continental lands, from whence there is probably a poleward decrease.

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ANTARES, ăn-tā'rēz (Gk. 'Αντάρης, *Antarēs*, like Ares, or Mars; from *αντί*, *anti*, against, opposite, compared with + "Αρης, *Arēs*, Mars). A red star, thought by the ancients to resemble Mars (q.v.). It is a double star, the most conspicuous in the constellation Scorpio, and sometimes called, from its position, *Cor Scorpionis*, or the Scorpion's Heart. It is often of use to navigators in finding longitude.

ANT'-BEAR'. The great ant-eater.

ANT-BIRD, ANT-CATCHER, ANT-THRUSH, etc. See ANT SHRIKE.

ANT'-EAT'ER. Any of various ant-eating mammals, especially those of the South American Edentate family Myrmecophagidæ. The head in this family is remarkably elongated, with a slender, tubular muzzle, and a small, toothless mouth, with a long, vermiform, protrusile tongue. The eyes and ears are very small. The legs are massive, and the toes united as far as the base of the claws, which are very large and strong, and are turned under the fore-feet as the animal walks. The great ant-eater, tamanoir, or ant-bear (*Myrmecophaga jubata*), a native of the tropical forests of South America, is about 2 feet high and 4 feet long without the tail, which is 2½ feet long. The compressed body is covered with long hair, gray, strikingly marked by a black breast-band, which narrows back to the top of the shoulders, while the fore-legs and feet are white. The hair is especially long upon the back and tail, which can be curled over the back, and is said to be held there as a shield during rain. The animal dwells in the dense forest, but is wholly terrestrial and does not burrow. It is timid, slow, and inoffensive, but at bay is able to defend itself effectively by means of its long fore-claws, with which it hugs and tears its enemy. These powerful claws are of service in tearing down the hills of the termites and ants, upon which it principally subsists. These are taken by means of the long tongue, which is covered with a sticky secretion from great salivary glands; this tongue is thrust among the disturbed ants or laid in their path, and, when a number have adhered to it, is drawn into the mouth.

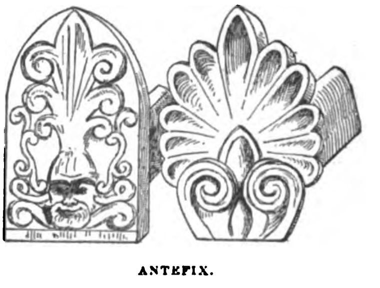
Only one young one is said to be produced annually, so that the creature is nowhere numerous; nor is this to be regretted, for it has few, if any, qualities to recommend it to man's attention. Another species, the tamandua (*Tamandua tetradactyla*), is much smaller, has a shorter head and short, bristly hair, and a slender, prehensile tail; its body is black, while the head, neck, fore-limbs, and hind-quarters are yellowish-white —a strange dress, varying a good deal among individuals. It also dwells in the equatorial forest of America, but is wholly arboreal, seeking its insect food and making its home in trees. A third species, the little, or two-toed, ant-eater (*Cycloturus didactylus*), is not larger than a rat, is clothed in silky fur, and dwells altogether in trees, for which its long, prehensile tail and curious feet have become especially modified; another species inhabits Costa Rica. For portraits of the three species mentioned above, see plate of Ant-Eaters.

Other animals called ant-eaters are: (1) The manids, or scaly ant-eaters. (See Manis.) (2) The aard-vark (q.v.). (3) The porcupine ant-eaters, or Echidnæ. (See Echidna.) (4) The Australian insectivorous marsupials of the genus Myrmecobius, as *Myrmecobius fasciatus*, of West Australia, about as large as a squirrel, chestnut red, with white and dark stripes on the back. It has a long, slender tongue, like a true ant-eater, but it has more teeth than any other living mammal. It scratches open ant-hills for its food. (See plate of Phalangers.) (5) Any of various ant-eating birds.

AN'TEDILU'VIAN (Lat. *ante*, before + *diluvium*, flood). A word used to denote whatever existed before the Flood. The antediluvian ages are those which elapsed before the Flood; and in theological language, the antediluvian religion means the religion of the patriarchs from Adam to Noah. In geology, the antediluvian period had no reference to the Deluge recorded in the Mosaic narrative, but signified only the final transformation of the earth by means of water. The term is not in current use at the present time.

AN'TEDON. See Crinoidea.

AN'TEFIX (Lat. neut. pl. *antefixa*, from *ante*, before + *fixus*, fastened, fixed). A terra-cotta or marble decoration along the edge of the roof of classic buildings, covering the end of the row of semi-circular tiles placed over the joints of the flat tiles on the roof. They were upright slabs, usually decorated with a single head or an anthemion, although sometimes they were composed of entire figures or even groups. The Etruscans developed this form of roof ornament even more than the Greeks.



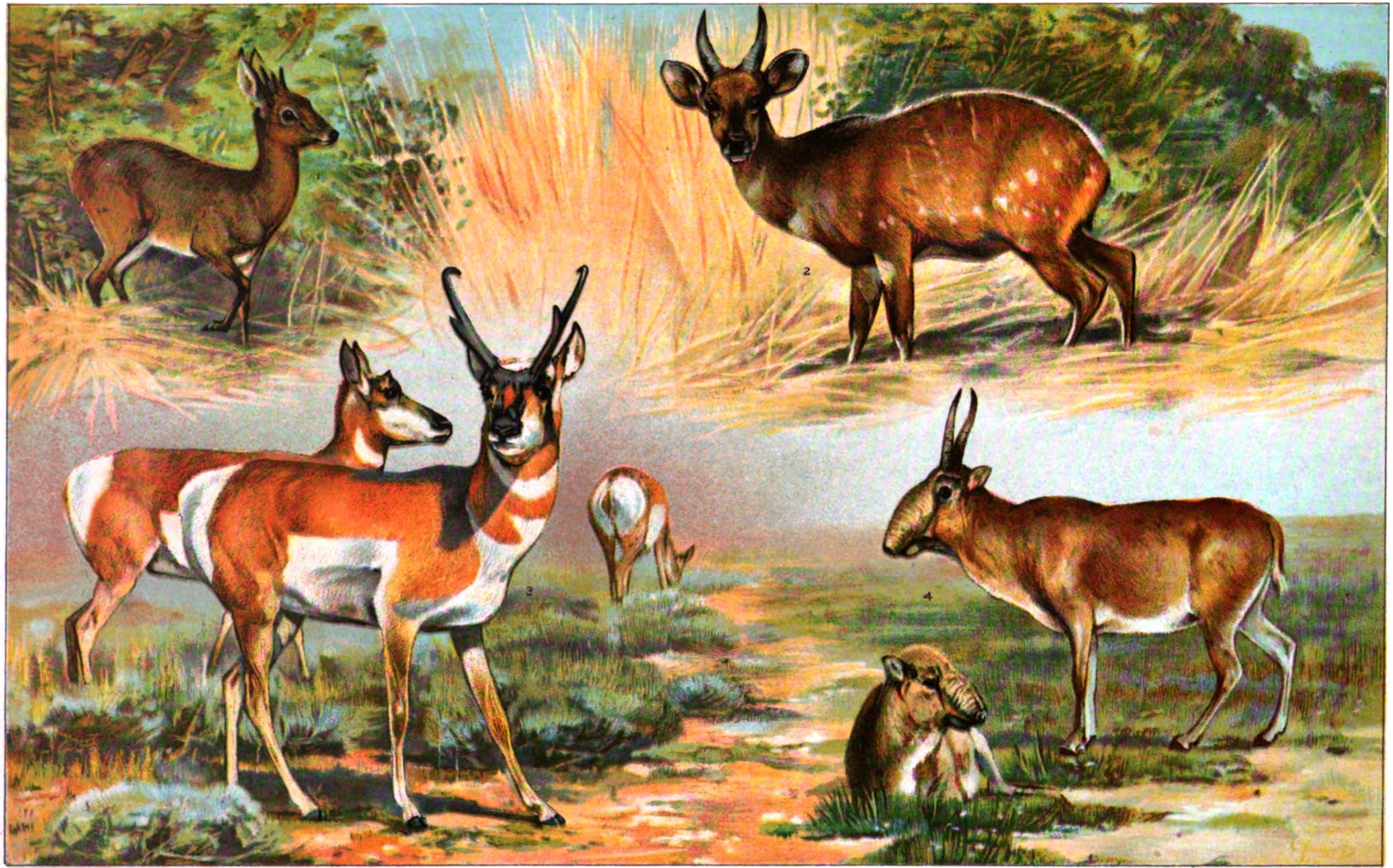
ANTEFIX.

ANTELAMI, ăn'tȧ-lä'mê, Benedetto. A north Italian architect and sculptor of the twelfth century; one of the most notable artists preceding Nicola Pisano. His masterpiece is the baptistery at Parma with its numerous and important sculptures.

AN'TELOPE (Gk. *ἀνϑόλοψ*, *antholops*, a horned animal). Any of many hollow-horned ruminants forming a group (formerly esteemed the family Antilopidæ) within the family Bovidæ, and usually classified between the cattle and goats. The English word, in its widest popular use, often includes on the one hand a group represented by the chamois and the Rocky Mountain goat, preferably designated goat-antelopes; and on the other the American antelope or prong-horn (q.v.), which belongs to a quite different family. Scientifically, as now restricted by R. Lydekker and recent students, the term excludes these forms. The group cannot be demarked from other bovines by definite characters, yet as a whole it is easily recognized by the graceful build of its members (exhibited in the accompanying illustrations), their short hair, lively colors, manner of carrying the head uplifted, and the absence of a goat-like beard. "The horns, which may or may not be present in the females, are generally long, more or less cylindrical, and often lyrate in shape; while they are frequently marked with prominent rings and have an upright direction. Their bony internal cores, instead of being honeycombed, as in the oxen, sheep and goats, are nearly solid throughout. These animals generally have a gland beneath the eye, by which they are distinguished from the oxen and goats."—(Lydekker). In size they vary from a foot in height to the bigness of a large horse. Almost all are timid, peaceable animals, with small means of defense, and trusting for safety to the agility and fleetness in which they excel. Most of them inhabit plains, and these are highly gregarious; a few are found only in mountainous regions, while others dwell in pairs or small bands in jungles and deep forests. Paleontologists inform us that antelopes are the most generalized members of the Bovidæ now existing, and "since they are also its oldest known representatives, it is probable that from them have been derived the more specialized types,"—oxen, sheep, goats, etc.

Though now wholly restricted to Asia and Africa, the antelopes had formerly a wide distribution in Europe and Asia alone. Their disappearance from Europe and spread into Africa within recent times (geologically speaking), and their enormous multiplication there, form one of the most remarkable incidents in the history of the mammalia. When South Africa was first penetrated by Europeans, many species were found ranging its grassy plains in enormous herds, which formed the principal resource for animal food of the natives and a great number of carnivorous animals. This continued until the middle of the nineteenth century, when the rapid spread of English and Dutch colonization swept them away. Vast numbers were wasted by sportsmen and reckless colonists, or were killed for the sake of their flesh and hides, until

ANTELOPES



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1 DUIKERBOK - CEPHALOLOPHUS SYLVICULTOR
2 BUSH BUCK - TRAGELAPHUS SYLVATICUS
3 PRONGHORN - ANTILOCAPRA AMERICANA
4 SAIGA - ANTILOPE SAIGA
1/10 NATURAL SIZE

now the great herds have disappeared from the remotest veldts, many species a few years ago numbered by tens of thousands are reduced to scattered bands, and others have become wholly extinct. The wide and rapid destruction of these abundant, valuable, and beautiful animals can be paralleled elsewhere only by the swift extermination of the American bison. Several species are represented only by small bands preserved upon private estates.

Antelopes fall into certain groups having a common resemblance. These will be outlined here, leaving the reader to consult for details the separate articles upon individual species, the most important of which will be found described in their alphabetical places. One collocation is that of the *antelopine* gazelles, including a large number of species elegantly shaped and colored, as a rule not exceeding 30 inches in height, with hairy muzzles and teeth resembling those of goats, and with ringed and usually lyrate or spiral horns; they inhabit deserts from the Cape of Good Hope to India. Here among less noteworthy kinds, fall the familiar ariel and other gazelles, the black-buck of India, the saiga, chiru, springbok, impalla, and the like. Another group (*cervicaprine*) is represented by the small African reed-bucks, the larger water-bucks, cobus, etc., the smaller rehboks and klipspringer, and the diminutive steinboks. A third (*cephalophine*) group is composed of the duikerboks and other forest-ranging species of Africa, among which are the smallest known ruminants, the least (see BLUEBUCK) being only 13 inches tall. Only the males of these are provided with horns, and one species (see CHOUSINGHA) has four horns. These pygmies are connected with the cattle by the *alcephaline* antelopes, all large African species characterized by their much greater height at the withers than at the rump, and by having horns in both sexes, the cores of which are cellular as in oxen; prominent examples are the hartbeests, blesbok, bontebok, and gnus. Diverging oppositely from the typical gazelles toward the goats, the *hippotragine* section has been made to include very large African antelopes having long, stout, ringed horns in both sexes, such as the sable and roan antelopes, the extinct blaubok, addax, gemsbok and allied species. Another set of large species is the *tragelaphine*, represented in India by the nilgai, and in Africa by the bushbuck, koodoo, eland, etc. They are the largest, most valuable, and handsomest of all, their ground colors being bright and often ornamented or "harnessed" with conspicuous stripes, while their faces are beautifully marked. Consult: For former abundance in Africa, Harris, *Game Animals of Africa* (London, 1840), with colored folio plates; Lichtenstein, *Säugethiere und Vögel aus dem Kaffernlande* (Berlin, 1842); and the narratives of Livingstone, Gordon Cumming, Andersson, Drummond, Baker, Schweinfurth, Selous, and similar explorers and sportsmen. For more modern conditions, Millais, *A Breath from the Veldt* (London, 1895); and Bryden, *Nature and Sport in South Africa* (London, 1897). For Asiatic species, Baker, *Wild Beasts and their Ways* (London, 1890); Blanford, *Fauna of British India: Mammals* (London, 1888). For Zoölogy, Sclater and Thomas, *The Book of the Antelopes* (London, 1894-1900); Brooke, *Proceedings of the Zoölogical Society of London* (1871-73).

For the so-called antelope of western North America, see PRONGHORN.

AN'TENA'TI (Lat. nom. plur. of *antenatus*, from *ante*, before + *natus*, born). In law and history, persons born before a certain time or event, especially with reference to the existence of rights which are claimed. The term is specifically applied: (a) To children born before the marriage of their parents. By the common law of England such children are held to be bastards and do not become legitimate upon the subsequent marriage of their parents, whereas in the civil and canon law *antenati* are legitimate and capable of inheriting the real property of the father as if born after marriage. The common-law rule prevails in the United States excepting where it has been changed by statute. (See BASTARD; HEIR; LEGITIMACY.) (b) In English history, to those natives of Scotland who were born before the accession of the Scotch King James VI. to the throne of England as James I., and whose status as English citizens was therefore disputed. (c) In American history, to Americans born in this country before the Declaration of Independence; and, also, to those citizens of the colony of New York who were born during the period of Dutch sovereignty and who survived the transfer of the territory and government to the English crown. The property rights of the antenati, and, to a certain extent, the benefits of the Dutch law were expressly preserved to them by the articles of capitulation, 1664. Consult the historical introduction to the Grolier Club, *Facsimile of Bradford's Laws of New York, 1694* (New York, 1894). See the articles ALLEGIANCE; ANNEXATION.

ANTEN'NÆ. See INSECT.

AN'TENNA'TA (Lat. *antenna*, sail-yard, Neo-Lat. a feeler; horn of an insect). A class of Arthropoda characterized by the possession of one pair of preoral feelers, three parts of oral limbs and head distinctly marked off from the trunk; respiration by tubular tracheæ, opening externally by segmentally arranged openings called stigmata. The class is divided into two subclasses: *Myriapoda*, or centipedes, etc., and *Hexapoda*, or insects (qq.v.).

ANTE'NOR (Gk. 'Αντήνωρ, *Antēnōr*). The wise Trojan who advised his fellow-citizens to send Helen back to her husband. In return for his friendliness to the Greeks, his house was spared during the sack of Troy. A later version represents him as betraying the city. Legends differ about him: one is that he built a city on the site of Troy; others make him the founder of various cities in northern Italy, or Cyrene.

ANTENOR ('Αντήνωρ). An Athenian sculptor of the sixth century B.C. He made the original statues of Harmodius and Aristogiton, which were carried to Susa by Xerxes (480 B.C.). After the conquest of Persia, they were restored by Alexander the Great, and were set up in the Ceramicus, where they were placed originally.

AN'TEPEN'DIUM (Lat. *ante*, before + *pendere*, to hang). A hanging in front of the altar. As the earliest Christian altars were usually tables of wood or marble, it was customary during service to hang or set in front of them a richly decorated piece of stuff or metal relief. See ALTAR.

ANTEQUERA, än'tā-kā'rȧ (anciently *Antiquaria*). An important manufacturing town in the province of Malaga, Spain, situated in a fertile plain at the foot of the Sierra de Antequera, on the Guadalhorce, 45 miles west of Granada (Map: Spain, C 4). It has a Moorish castle and is the seat of a number of hidalgos. There are some stately houses and a fine church of the Virgin. It is active in the manufacture of woolen goods, paper, soap, and silk. There is considerable trade in fruit, oil, and wine; and marble is quarried in the neighborhood. Pop., 1900, 31,665.

AN'TEROS (Gk. 'Αντέρως, from ἀντί, *anti*, against + ἔρως, *erōs*, love). In the mythology of the Greeks, the brother of Eros, and god of unrequited love.

ANTEROS, or **ANTERUS.** Pope, or rather bishop of Rome, from November 21, 235, till his death, January 3, 236. He comes between Pontianus and Fabianus.

ANTHE'DON (Gk. 'Ανθηδών). A town of Bœotia, situated at the foot of Mount Messapion, on the strait of Eubœa. The site, near the modern Lukisi, was described by Leake, *Travels in Northern Greece*, II. In 1889 excavations were conducted by the American School of Classical Studies at Athens, which brought to light a complex of foundations near the harbor, and what seems to have been a small temple on a hill outside the city. The course of the walls was also traced, and a number of bronze implements and sixty-four inscriptions found. The latter are chiefly gravestones, but give some idea of the local alphabet and dialect.

ANTHE'LIA (Gk. ἀντί, *anti*, against + ἥλιος, *hēlios*, the sun). Luminous rings opposite to the sun, seen when the observer looks toward his own shadow cast upon a cloud or bank of fog or on the dewdrops on the grass. The shadow is seen to be encircled by a glory consisting of one or several concentric rings, having their common centre at the anti-solar point. The rings are usually colored, red inside and blue outside, but these are not pure colors, because formed by many overlappings of elementary rings. The outside rings have but little color and fade off into white. The radius of the rings increases with the smallness of the globules that make up the fog or cloud. The largest ring ever observed is the "white rainbow," which has an angular radius of about 40 degrees. It is almost pure white, and is generally known by the name of the first observer, as Ulloa's ring. These rings are formed by the interference of rays of sunlight reflected from minute drops very much as in the case of the rings or glories seen close around the sun and moon. All these phenomena were imperfectly explained by Sir Isaac Newton as due to the dispersion of light refracted through drops of fog or rain; but the only satisfactory explanation is that first given by Dr. Thomas Young, and more fully developed recently by Dr. Pernter, which attributes them to diffraction or interference phenomena. Consult Pernter, *Meteorologische Optik* (Vienna, 1901). See Light.

AN'THELMIN'TIC (Gk. ἀντί, *anti*, against + ἕλμινς, *helmins*, a worm). Any medicine hostile to intestinal parasites. Anthelmintics which destroy are vermicides; those which expel, vermifuges. They act in one of three ways: (1) mechanically; (2) by some intoxicating influence; (3) by an actual poisonous effect. Among the remedies employed for the *Oxyuris vermicularis*, "seat-worm," or "thread-worm," are enemata of salt and water, or of infusion of quassia. For the *Ascaris lumbricoides*, or round worm, santonin (q.v.) and spigelia, or pink-root, are most frequently used. The drugs given to expel tæniæ, or tape-worms, are: aspidium, or male fern; pumpkin seeds, and bark of the pomegranate. Kamala (q.v.) is fairly efficient; cusso, or kousso, is of doubtful value. See Ascaris; Worm.

AN'THEM (M. Engl. *antempne*, earlier *antefne*, M. Lat. *antiphona*, from Gk. ἀντι, *anti*, against + φωνή, *phōnē*, voice, sound). A piece sung in alternate parts. A species of musical composition introduced into the service of the English Church after the Reformation, and appointed to be sung daily, at morning and evening service, after the third collect. The words of the anthem are taken from the Psalms, or other suitable parts of the Scriptures, and the music is either for solo or chorus, or a mixture of solo and chorus. It is rendered with or without instrumental accompaniment. In its origin, musical construction, and use, the anthem is similar to the motet of the Roman Church and the *Kantate* of the Lutheran Church. See Motet; also Antiphony.

AN'THE'MION (Gk. ἀνθέμιον, blossom, flower). A decorative motive in ancient, Oriental, and Greek art. It was frequently used, and on account of its graceful effect is often reproduced in modern times. It is sometimes called the honeysuckle ornament, and is closely connected with the conventionalized Egyptian lotus and the Assyrian palmette ornament. It takes the form of radiating clusters of flowers or leaves, and was used in architecture, in carving, in vase ornament, and in pictorial decoration. See Goodyear, *A Grammar of the Lotus* (New York, 1892).

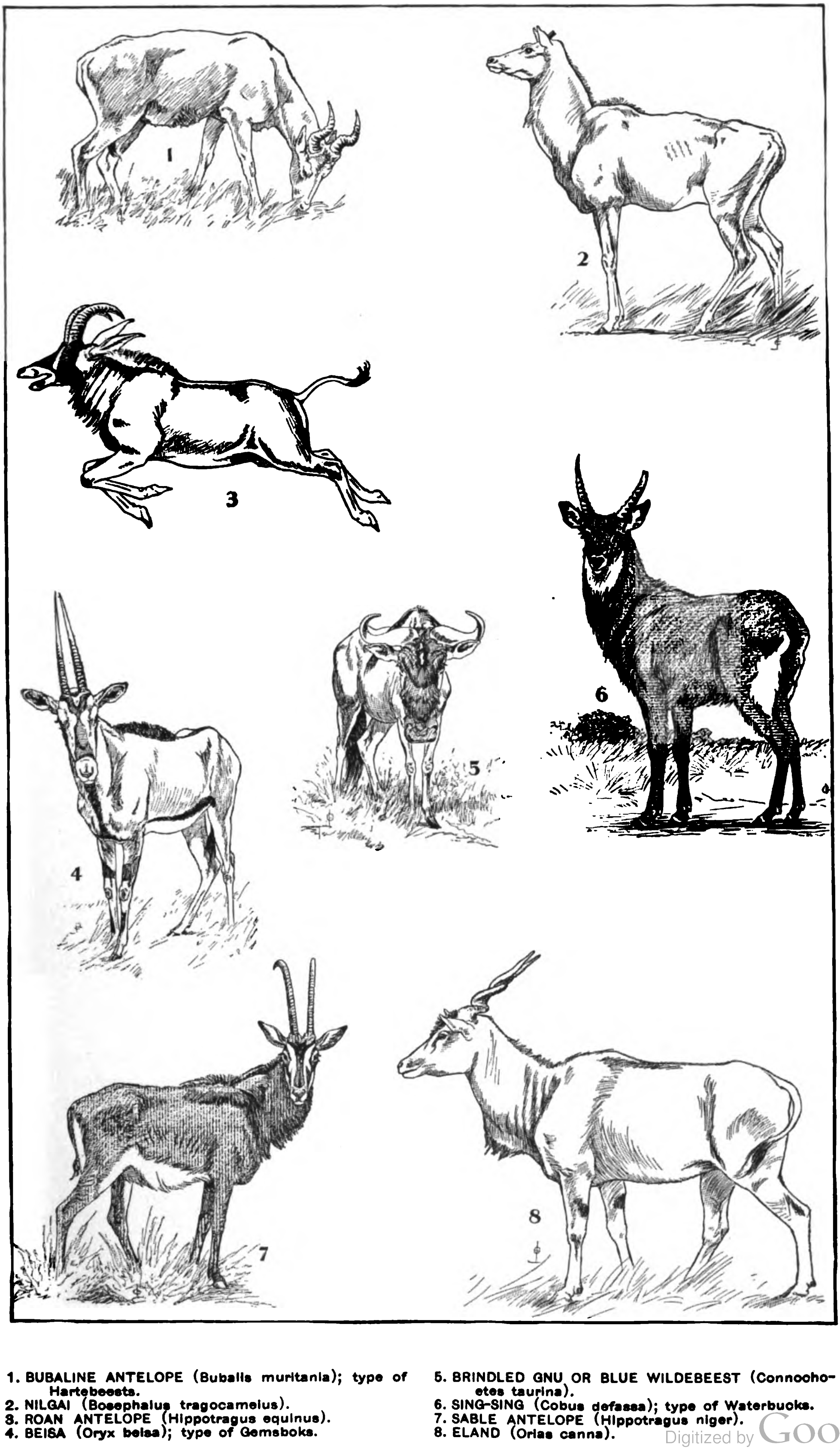
AN'THEMIS. See Chamomile.

ANTHE'MIUS (Gk. 'Ανθέμιος, *Anthemios*) (sixth century A.D.). A Greek architect, mathematician, and engineer; born at Tralles, in Asia Minor. With the assistance of his colleague, Isidore of Miletus, he planned and built for the Emperor Justinian the church of St. Sophia in Constantinople (532-37), one of the greatest buildings in architectural history, and so may be regarded as the founder of the developed Byzantine style. He wrote, among other mathematical treatises, a work on the subject of burning-glasses. Some fragments of his writings have been found. He continued the Greek tradition of uniting architecture and theoretical mathematics, which the Romans had discouraged, and he was one of the greatest architects of all ages.

ANTHEMIUS. An emperor of the West (467-472), and son-in-law of the Eastern Emperor Marcian. He was appointed to the Western throne by the Emperor Leo, at the instance of Ricimer, who afterward married Anthemius's daughter. A quarrel arose between them, and Ricimer proclaimed Olybrius Emperor of the West in 472, and marched on Rome, which he took by assault. Anthemius perished in the battle. His character is highly praised in a panegyric of Sidonius Apollinaris.

AN'THER (Gk. ἀνθηρός, *anthēros*, flowery, blooming). That part of a stamen which produces pollen. An anther consists of two small sacs, between which there occurs a certain amount of

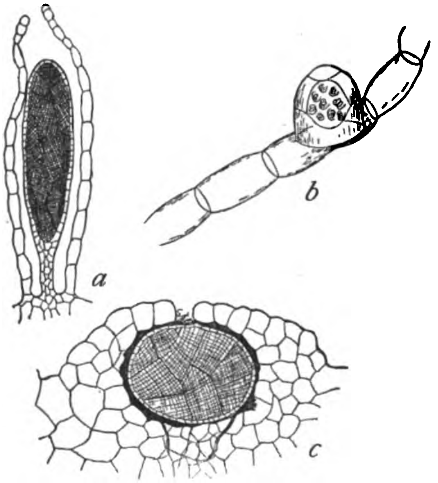
ANTELOPES



1. BUBALINE ANTELOPE (Bubalis muritania); type of Hartebeests.
2. NILGAI (Bosephalus tragocamelus).
3. ROAN ANTELOPE (Hippotragus equinus).
4. BEISA (Oryx beisa); type of Gemsboks.
5. BRINDLED GNU OR BLUE WILDEBEEST (Connochoetes taurina).
6. SING-SING (Cobus defassa); type of Waterbucks.
7. SABLE ANTELOPE (Hippotragus niger).
8. ELAND (Orias canna).

sterile tissue (the "connective"), which is often nothing more than the top of the axis of the stamen. See FLOWER.

AN'THERID'IUM (a diminutive after the Greek fashion from *anther*; see ANTHER). The male organ of plants; that is, the organ in which the sperms are developed. Among the algæ and fungi an antheridium is usually a single cell, and in the simplest forms in which antheridia appear this single cell is merely a nutritive cell which is used for the purpose of producing sperms. In most algæ and fungi, however, the antheridium is a distinctly differentiated cell set apart from the very first for the production of sperms. Among the mosses and ferns the antheridium is a many-celled organ of varying shape. The moss antheridium is a free organ and more or less club-shaped, a section showing that the wall consists of a single layer of sterile cells, and that the rest of the structure is a compact mass of very small cells, within each one of which a single sperm is organized. The antheridium springs open or bursts open in the presence of moisture and discharges its mass of cells and sperms, the latter of which free themselves by their movements and are ready to swim to the female organs. Among the ordinary ferns the antheridium is an imbedded organ, which discharges its sperms in one way or another at the surface of the prothallium.



ANTHERIDIA OF A MOSS (*a*), A FERN (*b*), AND A LIVERWORT (*c*).

With the introduction of heterospory (q.v.), which involves certain of the fern-plants and all of the seed-plants, the male plant is very much reduced in size, being entirely contained within the spore that produces it, which in the seed-plants is called the pollen grain. With this reduction of the male plant, the antheridium is correspondingly modified, so that it is a matter of discussion in such cases as to just what cell or cells may represent an antheridium. The organ, therefore, in the seed-plants does not stand out with the distinctness that it presents in the three lower groups, but it is none the less represented.

The name is an unfortunate one, since it means "anther-like," having been given under the impression that the anther of seed-plants is a male organ. It would be very desirable to change the name if such a thing were possible, and "spermary" has been proposed as a substitute.

AN'THESTE'RIA. See GREEK FESTIVALS.

ANTHEUNIS, än'tĕ'nė', GENTIL THEODOOR (1840—). A Flemish poet. He was born at Oudenarde, and removed to Brussels. He is one of the best lyric poets of Belgium. His verses are distinguished by depth of sentiment and euphony. Among his most popular songs are: *Lentelied*, *Ih ken een Lied*, *Vergeefs*, and *Getroume liefde*. Collections of his poems have been published under the titles: *Uit het Hart* (Leyden, 1875); *Leven, Lieven, Zingen* (The Hague, 1879).

AN'THOCY'AN (Gk. ἄνθος, *anthos*, flower + κύανος, *kyanos*, a dark-blue substance). The blue, purple, or red coloring matter found dissolved in the cell sap of flowers, fruits, young leaves and stems, dying leaves in autumn, etc. The term "erythrophyll" was formerly used in this sense. The chemistry of anthocyan is imperfectly known, but the substance appears to be one of the tannins or phenol compounds. Its color depends upon the character of the solution in which it is present; if acid, it is red; if alkaline, it is blue. Therefore, many blue flowers become reddish as they fade. The function of anthocyan in the living plant is not positively known, although numerous attempts have been made to explain its presence and distribution. (See COLOR.) (1) It has been held to be a protection to the green coloring matter of young leaves against too much light, which promotes its decomposition (see CHLOROPHYLL), especially when it is formed slowly on account of low temperature. (2) It is alleged to be of advantage to young leaves and shoots by increasing the absorption of the sun's energy, and thus raising their temperature. (3) By its action on light it probably facilitates the formation and action of a digestive substance (diastase) in leaves and so perhaps promotes translocation of food.

ANTHO'LOGY (Gk. ἀνθολογία, *anthologia*, a flower-gathering, from ἄνθος, *anthos*, flower + λέγειν, *legein*, to pick out). The title usually given to a book consisting of an unconnected series of choice thoughts, whether in prose or in verse, but generally in the latter. In ancient times, collections of this kind consisted largely of epigrams. 1. The earliest GREEK ANTHOLOGY was compiled by Meleager, of Gadara, in Syria, about 80 B.C. It was named *The Garland* (Στέφανος, *Stephanos*), and contained one hundred and thirty of Meleager's own epigrams, and selections from forty-seven other poets, including Alcæus, Anacreon, Archilochus, Sappho, and Simonides. Something more than one hundred years later, Philip of Thessalonica gathered the best epigrams of the preceding century into a collection, which he published in the reign of Caligula, and which at an early date seems to have been combined with Meleager's *Garland*. A third collection was made by Straton, of Sardis, in the second century A.D.; and a fourth by Diogenianus Heracleota. The latter seems to have been the first to adopt the name "anthology" (ἀνθολόγιον ἐπιγραμμάτων, *anthologion epigrammatōn*). The writing of epigrams then languished, but it was revived again during the sixth century in Constantinople; and the productions there of Julianus, Christodorus, Leontius, Paulus Silentiarius, and others gave occasion for a new anthology, made under Justinian by Agathias of Myrina and called by him *The Cycle* (*Κύκλος*, *kyklos*). Apparently, the combined anthology of Meleager and Philip was current for a long time beside the *Cycle* of Agathias. In the tenth century small anthologies, the so-called *Sylloge Euphemiana* and the *Sylloge Parisina*, were made. Better known is the large compilation of Constantius Cephalas in fifteen books, which dates from the early part of the same century. Four centuries later, the monk Maximus Plamides made a careless selection from Cephalas's compilation in seven books. This latter was the only anthology known to western Europe until the seventeenth century. It is preserved at Venice in the single manuscript from which it was first published by Lascaris (Florence, 1494). It has been frequently reëdited, and was translated into Latin by Grotius.

In 1607, however, Salmasius discovered and copied in the Palatine Library at Heidelberg the single manuscript of Cephalas's larger compilation, now known as the *Palatine Anthology*. Salmasius's copy was published first by Brunck in his *Analecta* (1776); this edition was superseded by Jacobs's *Anthologia Græca* (1794-1803; improved edition, 1813-17), and was again reedited with the addition of epigrams from inscriptions by Dübner (2 volumes, 1864; third volume by Cougny, 1890); Stadtmüller's critical edition of it is not yet completed (Volume I., 1894; II., 1, 1899). In all, over three hundred poets, from pre-classical to Byzantine times, are represented in this *Anthology;* the collection is invaluable as a mirror of Greek civilization and thought, and the epigrams express the entire range of human feeling with a brilliancy and cleverness that translation cannot reproduce. Translations have been made into English by Wrangham, John Sterling, Merivale, Garnett, Symonds, and others. Consult: Symonds, *Studies of the Greek Poets* (London, 1893); Butler, *Amaranth and Asphodel* (London, 1881); Mackail, *Select Epigrams* (London, 1891). On the smaller collections, consult Dilthey, *De Epigrammatum Syllogis Quibusdam Minoribus* (1887).

2. Latin Anthologies. In 1573, Scaliger published at Leyden, in imitation of the Greek anthology, a Latin anthology, under the title *Catalecta Veterum Poëtarum*, and Pitthöus one at Paris, 1590. A larger collection was issued at Amsterdam (1759 and 1773) by Peter Burmann the younger, under the title *Anthologia Veterum Latinorum Epigrammatum et Poëmatum*. In the nineteenth century a more careful anthology was undertaken by Riese (1869-70), a second edition of which has been published (Leipzig, 1906).

Asiatic literature is extremely rich in anthologies, which consist sometimes of extracts from the best poets, arranged according to the subject, and sometimes of "beauties" of their best poets, with biographical notices, which are either placed in chronological order or according to the countries in which the authors lived.

3. Arabic Anthologies. The oldest Arabic anthology is the Moallakat (see Antar), consisting of the seven most celebrated pre-Islamic poems. A much larger collection was made by Abu-Temâm (died 846), who published selections from the old Arabic songs composed previous to the time of Mohammed, arranged them in ten books, and named the entire collection after the first book, which consisted of war songs, *Al Hamâsa*. A German translation by Rückert was published in 1846, under the title *Hamasa*. Another famous anthology is the *Divan* of the Hudhailites (an Arabic tribe), a partial edition of which was published by Kosegarten, and a German translation by Abicht (1879). Wellhausen completed the edition (Arabic and German) in 1887, as Part I. of *Skizzen und Vorarbeiten*, published by him. Abu'l-Faradj of Ispahan (died 967) gathered together in his *Kitâb al-Ag̣hâni* (Book of Songs) all the ancient Arabic songs down to the first centuries of the caliphate. It was published by Kosegarten in 1840; but the complete work, in twenty volumes, was not issued till quite recently by the Arabic press of Bulak, to which Brünnow added the twenty-first volume in 1888. An Index to this anthology is now being prepared by a group of scholars under the editorship of I. Guidi. Abu'l-Faradj accompanied this work with a minute commentary, which makes it one of the most interesting of the old Arabic literature. But the richest and most complete anthology of the later Arabic poetry is *Yatîmat al-Dahr* (The Pearl of the World), by Taalabi, in which the writers are arranged according to the provinces in which they lived. It has been continued and enlarged since the period of the original compiler. Besides these and similar national anthologies, collections have been made in almost every province where the Arabic culture and speech prevailed. Such, for example, are the numerous Arabico-Spanish anthologies, though these are but little known.

4. Turkish Anthologies. The number of anthologies in the West Turkish, or, as it is generally called, the Turkish language, is very large. The most famous are: *Hesht Behesht* (The Eight Paradises), by Sehi of Adrianople (died 1548); *Taskarat ash-Shuara* (Lives of the Poets), by Latifi (died 1582), and, under the same title, a similar work of Ashik Chelebi (died 1571); and the great collection, *Subdat al-Ash'ār* (The Blossoms of Poetry), by Kassade (died 1621). The substance of these anthologies is to be found in Hammer Purgstall's *Geschichte der osmanischen Dichtkunst* (Pesth, 1836).

5. Persian Anthologies. The Persian literature has many anthologies, which are called *safinah* (ship), *majmai* (collection), *bayād* (album), *intikhāb* or *muntakhab* (selection), and the like. Among these are the *Muntakhab ul-ash'ār* (Selection of Poems), compiled in 1748; and the *Daqā'iq ul-ash'ār* (Subtleties of Poems), compiled in the eighteenth century, which deals, as its name implies, especially with the more artificial styles of Persian poetry. The numerous biographical dictionaries of poets, called *Tadhkirat*, or memoirs, contain many verses from the poets whose lives are recorded. One of the most important of these is the *Tadhkirat ash-shu'ārā*, written by Daulat-Shāh in 1487, and edited by E. G. Browne (London, 1901). Special mention must also be made of the *Farhangi ash-shu'ārā* (Dictionary of Poets), which contains an anthology of about 22,450 distichs in Persian, and which was abridged and freely imitated by Hammer-Purgstall in his *Duftkörner aus persischen Dichtern gesammelt*, reëdited by Bodenstedt (Stuttgart, 1860).

6. Indian Anthologies. The literature of the Mohammedan population of Hindustan,

which is a mere copy of Persian literature, has also several anthologies. The most important are: *Gulzāri Ibrāhīm* (Rose Garden of Ibrāhīm), by 'Alī Ibrāhīm, containing biographical notices of three hundred Hindustani poets, with specimens of their writings; the collection called *Diwāni Jihān* (Divān of the World), by Bēnī-Narāyan; *Gulshāni Hind* (Garden of India), by Mirzā 'Alī Lutf; *Guldasta'i Nishāt* (Garland of Pleasure), by Manū Lāl (Calcutta, 1836), and *Guldasta'i Nazninān* (Garland of Delights), by Karīm-ad-Dīn (Calcutta, 1845). The substance of these works is to be found in Garcin de Tassy's *Histoire de la littérature hindoue et hindoustanie* (second edition, Paris, 1839-47), which, under the title of *Tabakāli Shurāi Hindi*, was translated into Hindustani by Karīm-ad-Dīn (Delhi, 1848). In the pure Hindu we have a rich collection of songs, the *Rāgsāgar* (Ocean of Musical Verse), by Krishnānanda (Calcutta, 1845).

7. SANSKRIT ANTHOLOGIES. The Sanskrit literature is not so rich in anthologies as are other Oriental literatures. But the collections, comprising a hundred strophes each (*Śatakas*), and attributed to many poets, may almost be termed anthologies. True Sanskrit anthologies are the *Saduktikarṇāmṛta*, or "ear-nectar of good sayings," by Śridharadasa (about 1205 A.D.), the *Śārngadharapaddhati*, or Anthology of *Śārngadhara*, and Vallabhadeva's *Subhāshitāvalī* (Series of Good Words). Böhtlingk, *Indische Sprüche*, 3 volumes (St. Petersburg, 1870-73), contains an anthology of 7613 Sanskrit strophes, with a literal German translation.

8. CHINESE ANTHOLOGIES. The oldest anthology in the world is that which Confucius has handed down under the name of the *Shi-King*, or Book of Songs, forming one of the five great canonical books, or sacred classics of the Chinese. Chinese authors assert that about 3000 other poems were known in the time of Confucius. The *Shi-King* consists of 311 pieces, which picture vividly the manners and customs, the state of knowledge and art, and the aspects of nature in the states which afterward became China. The best translation with critical apparatus is by James Legge (London, 1876). There is also a version in Latin by Lacharme (Stuttgart, 1830), and one in German by Rückert (Altona, 1833). The poems of the Liang Dynasty (502-557 A.D.), and of the Tang Dynasty (618-905), have also been collected, but are only in part translated.

9. JAPANESE ANTHOLOGIES. The Japanese abound in anthologies, since they consider poetry more as the production of an epoch than of an individual. The oldest and largest anthology, compiled in the eighth century, is called *Manyoshu*, or *Collection of Ten Thousand Leaves*. It contains 4565 songs, mostly in 31-syllable poems. The *Kokinshu*, or *Songs Ancient and Modern*, numbering 1099, was finished about 922. Another anthology of the same century, *Gosen Wakashu*, contains 1356 short poems. Other collections were made by order of the Mikados in the succeeding centuries, ending with the fifteenth, and these, with *Songs Ancient and Modern*, are known under the general name of the *Anthologies of the One and Twenty Reigns*. All of these books have had abundant commentary, and are valuable to the student and historian. There are innumerable other collections made by imperial or private order, besides many selections of one hundred songs each, the most famous of the latter being the *Hiaku-nin-is-shiu* (one hundred poets, one verse), translated into English with notes by F. V. Dickens (London, 1866), and Clay MacCauley (Tokio, 1899). Consult also, *Anthologie japonnaise*, by Leon de Rosny, Paris, 1870, and B. H. Chamberlain, *Classical Poetry of the Japanese* (London, 1880).

AN'THON, CHARLES, LL.D. (1797-1867). An American classical scholar and teacher. He was born in New York City, graduated at Columbia College in 1815, studied law and was admitted to the bar in 1819, but never practiced. The next year he became adjunct professor of Greek and Latin at Columbia, and after fifteen years, became full professor. From 1830 to 1867 he was also head master of the grammar school of Columbia College. He was exceedingly efficient as a teacher, and won considerable reputation by his annotated editions of a large number of classical authors, prepared as school and college text-books. Besides nearly fifty such works, he published a new edition of Lemprière's *Classical Dictionary* (1822), a new Classical Dictionary (1841), a dictionary of Greek and Roman antiquities (1843), and a number of other manuals which were long and extensively used by classical students, both in this country and in England.

ANTHONY, ăn'tō-nĭ. A city and county seat of Harper Co., Kan., 56 miles southwest of Wichita, on the Missouri Pacific, the Atchison, Topeka, and Santa Fe, and other railroads (Map: Kansas, D 4). It controls a trade in the products of the surrounding agricultural and stock raising region, and has some manufactures. Pop., 1890, 1806; 1900, 1179; 1905, 2026.

ANTHONY, CLEMENS THEODOR (1755-1836). King of Saxony. Upon the death of his brother Frederick Augustus I., on May 5, 1827, he succeeded to the throne. After the disturbances of 1830 he appointed his nephew, Prince Friedrich August, co-regent, and on September 4 of the following year he gave his sanction to a constitutional government for the kingdom.

ANTHONY, HENRY BOWEN (1815-84). An American journalist and legislator. He was born at Coventry, R. I., and graduated at Brown University in 1833. He became editor of the Providence *Journal* in 1838, and continued as such for more than twenty years. In 1849, and again in 1850, he was elected Governor of Rhode Island, on the Whig ticket. He was a Republican member of the United States Senate from 1859 until his death, and served twice (1863 and 1871) as president *pro tem.* A collection of his historical and memorial addresses was printed for private circulation in 1875. He bequeathed to Brown University the Harris collection of American poetry, containing about 6000 volumes. See the *Anthony Memorial* (1886), a catalogue of the collection, with a sketch of the donor.

ANTHONY, JOHN GOULD (1804-77). An American conchologist. He was born at Providence, R. I., and for many years was in commerce, but his studies in natural history resulted in his being invited by Professor Louis Agassiz, in 1863, to the directorship of the conchological department of the Museum of Comparative Zoölogy at Harvard University. In 1865 he accompanied Professor Agassiz on the Thayer expedition to Brazil. He was an acknowledged authority in his field of research, and published *A New Trilobite: Ceratocephala Ceralepta* (1838), *Descriptions of Three New Species of Shells* (1839), *Descriptions of New Species of American Fluviate Gasteropods* (1861), *Descriptions of New American Fresh-Water Shells* (1866), and other works.

ANTHONY DE DOM'INIS. See Dominis.

ANTHONY, St. See Antony, St.

ANTHONY, St., Cross of, or the Tau Cross. A cross, shaped like the letter T. In heraldry the name denotes an ordinary cross consisting of two stripes, one horizontal, the other vertical, crossing each other in the centre of the escutcheon.

ANTHONY, St., Fire of. The Rev. Alban Butler, in his *Lives of the Saints,* gives the following account of the origin of this name: "In 1089, a pestilential erysipelatous distemper, called the *sacred fire,* swept off great numbers in most provinces of France; public prayers and processions were ordered against this scourge. At length, it pleased God to grant to many miraculous cures of the dreadful distemper to those who implored his mercy through the intercession of St. Anthony, especially before his relics; the church (of La Motte St. Didier, near Vienne, in Dauphiné) in which they were deposited was resorted to by great numbers of pilgrims, and his patronage was implored over the whole kingdom against this disease." The "Order of Canons Regular of St. Anthony," a religious fraternity, founded about 1090, for the relief of persons afflicted with the fire of St. Anthony, survived in France till 1790.

ANTHONY, Susan Brownell (1820-1906). An American reformer. She was born in Adams, Mass., the daughter of a Quaker. She taught school from the age of fifteen to thirty; was active in the total abstinence and anti-slavery movements, and from the Civil War devoted herself entirely to the woman suffrage movement. She founded (1868) and for three years published *The Revolution,* a woman's rights paper. She was arrested, tried, and fined for voting at the election of 1872. She was an eloquent speaker, lectured extensively in England and throughout the United States, and took part in many State campaigns, and appeared before many Congressional committees. She contributed to leading magazines and (with Mrs. Elizabeth Cady Stanton and Mrs. Matilda Joslyn Gage) published an extensive *History of Woman Suffrage* (3 volumes, New York, 1881-87). For her life, consult Harper, *Life and Work of Susan B. Anthony* (2 volumes, Indianapolis, 1898).

ANTHONY, William Arnold (1835—). An American physicist. He was born at Coventry, R. I., graduated at the Sheffield Scientific School of Yale University, and was professor of physics and chemistry in Antioch College (Ohio) from 1867 to 1869. From 1869 to 1872 he was professor of physics at the Iowa Agricultural College, and from 1872 to 1887 professor of physics at Cornell University. In 1887 he became a consulting electrician. He has contributed a chapter to E. A. Thompson's *Roentgen Rays and Phenomena of the Anode and Cathode* (New York, 1896), and (with C. F. Brackett) has written a *Manual of Physics.*

ANTHONY OF BOUR'BON. See Antoine de Bourbon.

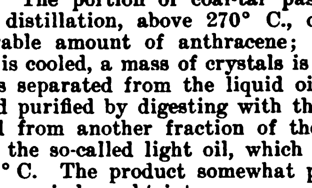
ANTHONY'S NOSE. A projecting bluff on the Hudson south of West Point, said to have been named after a trumpeter of Governor Stuyvesant's.

ANTHOPH'YLLITE. A name applied to an orthorhombic mineral of the amphibole group, containing the metals magnesium and iron and silicic acid. It commonly occurs in lamellar or fibrous masses that have a vitreous lustre and vary in color from brown to green. A "hydrated anthophyllite" has been described in several instances, but in most cases the mineral has been shown to be really a hydrated monoclinic amphibole. Anthophyllite occurs in metamorphic rocks.

AN'THOXAN'THUM. See Sweet Vernal Grass.

AN'THOZO'A (Gk. ἄνθος, *anthos,* flower + ζῷον, *zōon,* animal), or Actinozoa. An order of cœlenterates, characterized by their polyp-like form. It contains the sea-anemones and all the corals except millepores. See Cœlenterata; Corals, and Sea-Anemones.

AN'THRACENE (Gk. ἄνθραξ, *anthrax,* coal). An organic substance composed of carbon and hydrogen, and obtained from coal-tar. The production of anthracene has been of great commercial importance since the discovery of the processes by which it is converted on a large scale in the valuable alizarin dyes. (See Alizarin.) The portion of coal-tar passing, during its distillation, above 270° C., contains a considerable amount of anthracene; when this portion is cooled, a mass of crystals is deposited, which is separated from the liquid oil by pressure and purified by digesting with the naphtha obtained from another fraction of the coal-tar, namely, the so-called light oil, which passes below 170° C. The product somewhat purified in this manner is brought into commerce under the name of "50 per cent. anthracene," and is employed in the manufacture of alizarin. To isolate pure anthracene from this product, it is distilled with potash, and the distillate is treated with carbon disulphide, in which anthracene is nearly insoluble; the remaining traces of impurities may then be eliminated by recrystallization from hot benzene. Pure anthracene is a colorless crystalline substance melting at 213° C. and boiling at 360° C.; it is insoluble in water, and but sparingly soluble in alcohol. Graebe and Liebermann obtained it from the coloring matter of madder, and then, by reversing the process, artificially prepared that coloring matter (alizarin) from anthracene. The chemical constitution of anthracene is represented by the formula:



Consult Gnehm's *Die Anthracenfarbstoffe* (Brunswick, 1897).

AN'THRACITE (Gk. ἀνθρακίτης, *anthrakitēs,* from ἄνθραξ, *anthrax,* coal). A term used to designate the highest grade of coal, or that having the highest percentage of fixed carbon, and lowest volatile contents of all the coals. It has been produced from bituminous coal by alteration through the action of pressure and heat. These conditions are produced when rock-masses are folded up into mountains, or when beds of bituminous coal are approached or penetrated by an intrusion of igneous rock. In passing from the horizontal coal measures of Western Pennsylvania and Ohio to the greatly folded beds of Eastern Pennsylvania, the coal changes from bituminous to anthracite. At Crested Butte, Colorado, beds of bituminous coal are found to change to anthracite in those portions of the mass which are in close proximity to basaltic rocks that have been intruded into the beds underlying the coal in that region.

Anthracite has great heating power; it burns slowly, giving off but little smoke, and is consequently very clean. The average chemical composition of anthracite coal from different localities is as follows:

	Fixed Carbon	Volatile Matter	Water	Ash	Sulphur
Mammoth vein, Pa.	86.38	3.08	4.12	5.92	.50
Anthracite, Col....	82.33	9.96	.81	6.90	1.06
Madrid, N. Mex....	93.02	1.04	.16	5.78	.117
Shan-si, China.....	82.74	5.55	1.55	10.15	.25

Anthracite is found at a number of widely separated localities; but the areas underlain by it are seldom large because its formation is dependent on local conditions. In the United States it is found in Eastern Pennsylvania, where it forms several detached areas aggregating about 470 square miles. These fields are known as the Southern or Schuylkill field (140 square miles); Western Middle field (90 square miles); Eastern Middle field (40 square miles); Northern or Wyoming (200 square miles); Loyalsock or Western Northern. The coals all belong to the Middle Carboniferous or Pennsylvanian Series, at the base of which is a hard bed known as the Pottsville conglomerate. After beds of the Coal-measures had been folded into basins, the presence of the outcropping ledges of conglomerate along the crests of the ridges protected the coal beds to a large extent and have kept them from being entirely worn away by weathering and erosion. The total number of workable anthracite seams is about 15, but several others are also known. The aggregate thickness of the beds increases from west to east; the best known is the Mammoth Bed, which in places may exceed 100 feet in thickness, while elsewhere it may split up into several beds separated by layers of shale. Wilkes-Barre, Scranton, Hazelton and Pottsville are important mining towns in the region. At Crested Butte in Colorado, and near Madrid, New Mexico, anthracite is found in beds of Upper Cretaceous age, the formation of the anthracite in each case being due to igneous intrusions. Indeed, at the latter locality, the change from bituminous to anthracite coal takes place within a distance of 2000 feet. In Europe anthracite coal is found in the Carboniferous of South Wales. It is also known in France and Belgium. What are probably the largest deposits in the world are those around Tse-Chow in the province of Shan-si, China. Baron von Richthofen estimated that the unmined anthracite coal in Shan-si amounted to 630,000,000,000 tons, and that the area was greater than that of Pennsylvania.

Anthracite coal, after mining, goes through a crushing and sorting process in coal-breakers, in which the machinery consists of crushing-rolls and screens. In this treatment the coal is separated into the different sizes given below, and particles of slate are eliminated. Much of the latter is separated by screens having the bars set at an angle, so that when a mixture of coal and slate passes over them the slate particles, owing to their thinness, slip through, while the coal passes by. Pieces of mixed coal and slate are known as *bone-coal*, and are picked out by boys when the smaller sizes of coal come down the shutes from the screens. Recently, wet methods of separation of slate and coal, by means of jigs (q.v.) have been adopted with great success. The capacity of some breakers is very large, being as much as 2000 to 3000 tons of marketable coal per day of ten hours.

The following sizes are shipped from the breaker:

Broken, or Grate coal, which passes through 4-inch mesh, but not through 2.5-inch mesh.

Egg coal, which passes through 2.5-inch mesh, but not through 1.75-inch mesh.

Stove coal, which passes through 1.75-inch mesh, but not through 1.25-inch mesh.

Chestnut coal, which passes through 1.25-inch mesh, but not through .75-inch mesh.

Pea coal, which passes through .75-inch mesh, but not through .50-inch mesh.

Buckwheat coal, which passes through .50-inch mesh, but not through .25-inch mesh.

Very coarse lumps are known as "steamboat coal," and some finer sizes are at times separated into two kinds, which are known as rice and flaxseed. The finest refuse from the breakers and mines is known as "culm," and has been a source of much concern since, through being considered as waste, it has been allowed to collect in enormous heaps, forming a marked topographic feature of the anthracite regions. Owing to the fineness of this material, it was for some years found difficult to burn it in grates, as it packed and hindered the entrance of air. In recent years methods of utilization for culm have been found, and many of the banks have been worked over and the coarser particles washed out and sized. It can be burned in specially constructed grates, or can be mixed with tar and pressed into briquettes for use with the ordinary grate. Another important use is for filling in abandoned or partially worked-out mines, which is done by washing the culm down through a pipe into the mine, where it settles into a compact mass.

In the trade, anthracite is sometimes classed as follows: Free burning, white ash, hard white ash, Wyoming red ash, Lehigh red ash, Shamokin, Lykens Valley red ash, Schuylkill red ash, Trevorton, Lorberry red ash, and Bernice white ash. The hard white ash commands the best price.

The production of anthracite coal in Pennsylvania from 1899 to 1904 was as follows:

Year	Total product long tons	Value at Mines	Average price per ton	No. employed	Average No. days worked
1899	53,944,647	$88,142,130	$1.80	139,608	173
1900	51,221,353	85,757,851	1.85	144,208	166
1901	60,242,560	112,504,020	2.05	145,309	196
1902	36,940,710	76,173,586	2.35	148,141	116
1903	66,613,454	152,036,448	2.50	150,483	206
1904	65,318,490	138,974,020	2.35	155,861	200

It is also of interest to note the increase in shipments since the beginning of the industry:

Anthracite Coal Shipments, 1825 to 1904.

1825	34,893	long tons	1870	16,182,191	long tons
1830	174,734	" "	1880	23,437,242	" "
1835	560,758	" "	1890	36,615,459	" "
1840	864,379	" "	1900	45,107,484	" "
1845	2,013,013	" "	1904	57,492,522	" "
1860	8,513,123	" "			

The exports of anthracite in 1904 were 2,228,392 long tons valued at $11,077,470, and the imports 72,529 long tons valued at $220,664.

The annual production of anthracite in Colorado and New Mexico combined amounted to 72,074 short tons in 1904. Various estimates of the amounts of anthracite remaining in the Pennsylvania fields have been made, and all agree in the conclusion that the deposits will last at the present rate of production for more than one hundred years. For illustration, see Coal.

Bibliography. For statistics of production, consult volumes on *Mineral Resources*, issued annually by the United States Geological Survey; various reports of the Second Geological Survey of Pennsylvania, and the Annual Reports of the Bureau of Mines, Pennsylvania. Consult also: J. J. Stevenson, "Origin of Pennsylvania Anthracite," *Bulletin of the Geological Society of America*, Volume V., page 39 (Rochester, 1894); J. J. Stevenson, "The Cerrillos Coal Field," *Transactions of the New York Academy of Sciences*, Volume XV., page 105 (New York, 1896); N. F. Drake, "Coal Fields Around Tse Chau, China," *Transactions of the American Institute of Mining Engineers*, Volume XXX. (New York, 1898). See also Coal, and Pennsylvania.

ANTHRAC′NOSE (Gk. *ἄνθραξ*, *anthrax*, carbuncle + *νόσος*, *nosos*, disease). A group of fungous diseases of plants, in which the fruits, stems, and leaves suffer serious injury. Common forms are found upon beans, blackberries, raspberries, cucumbers, egg-plants, grapes, cotton, peppers, and spinach. Species of *Colletotrichum* and *Glœosporium* cause most of these diseases. In the fruit attacked definite round discolored spots or pits appear, with a usually light-colored centre, surrounded by darker zones. See Grape Anthracnose; Bean; etc.

AN′THRAPUR′PURIN. See Purpurin.

AN′THRAX (Gk. *ἄνθραξ*, coal, carbuncle, malignant pustule; Fr. *charbon*). A specific, infectious disease produced by a pathogenic microorganism, *Bacillus anthracis*. The disease is known as *charbon*, inflammation of milt; *milzbrand*, *carbonchio*, *mjeltbrant*, miltbrand, and Siberian plague; in man, as malignant pustule, or carbuncle, splenic fever, wool-sorter's disease, and, incorrectly, malignant œdema.

Anthrax was the first disease traced to bacterial generation. It is most prevalent among herbivorous animals—cattle, horses, sheep, and goats, varying in relative frequency with the region. The camel and various members of the deer family are frequently affected. The disease is rare in swine, and only occasional in carnivora. Anthrax is frequently transmitted to man, especially through abrasions of the hands in cases of those who handle infected wools or hides. It may also be implanted in the lungs, through inhalation of infected dust, or in the intestines, through swallowing food containing anthrax spores. Purulent or necrotic changes occur in each case, with pustules in the skin; œdema, lobular pneumonia and pleurisy; or mycosis in the intestines. The lymph glands are swollen, and the spleen becomes enlarged, dark, and soft. Œdema, fever, diarrhœa, delirium, and hemorrhages are followed speedily by death. Though said to be prevalent in Europe, but 42 cases of malignant pustule in human beings were reported in the United States in 1900.

Enzoötic outbreaks of anthrax have been known from time immemorial, and in all parts of the globe. In cattle, veterinarians distinguish three forms of anthrax: apoplectic, in which the animal suddenly drops to the ground and dies in convulsions after a few hours; the acute form without external swellings, most frequent in cattle, in which the temperature is increased from 41° to 42° C., muscular trembling, general prostration, and labored breathing appear, and death supervenes, with signs of asphyxia, in from ten to twenty-four hours; the sub-acute form, which is rare, with symptoms the same as in the acute form, but less pronounced.

In both horses and cattle an external form of anthrax occurs, during which tumors or carbuncles develop under the skin. These tumors are distinguished from those of black-leg by the fact that they do not emit a crackling sound on being stroked. Before death the discharges of the body may become mucous, or even bloody. In animals which die of anthrax, blood-clots are found on nearly all the vital organs, and the spleen is enlarged to from two to five times its normal size. If needful, a definite diagnosis may always be made by an examination of the blood for the presence of the anthrax bacillus.

In countries subject to the ravages of anthrax, the disease is usually restricted to well-defined areas, which seem to be permanently infected. Anthrax is most common in localities subject to inundation. Ponds of stagnant water and streams polluted with the waste from tanneries and morocco factories may serve as sources of infection. Perhaps the most common means for the spread of anthrax infection is found in the bodies of animals dead of the disease. The anthrax bacillus may gain entrance to the body of an animal in the inspired air, in food or water, or in wounds of the skin. The rapidity with which the different symptoms of anthrax develop depends largely upon the relative resisting power of the animal. The virulence of the anthrax bacillus is only slowly affected by desiccation.

The bacillus in blood drawn from affected animals and dried is destroyed by exposure to direct sunlight for a period of eight hours. Anthrax spores may retain their vitality in the soil for an almost indefinite period, especially if situated at some depth, where they are protected from the action of light and oxygen. Putrefaction destroys the vegetative form of the bacillus, but does not affect the spores. In the filamentous form the bacillus is killed by a few minutes' exposure to a temperature of 55° to 58° C. The spores are very resistant to dry heat, a temperature of 120° to 140° C. for three hours being required to kill them. In 1880, Pasteur, Chamberland, and Roux tried numerous experiments in attenuating the virus of anthrax by exposure to the air. The oxygen of the air was found to have the effect of rendering the bacillus less pathogenic, especially when cultures were spread out in a thin layer. Toussaint was the first to obtain an attenuated anthrax virus by exposure to heat. Recently excellent results have been had in vaccinating sheep and other animals with a mixture of anthrax bacillus and some non-pathogenic bacillus.

Three methods for immunizing animals against anthrax have been devised: inoculation with attenuated virus, with toxins, and with antitoxic serums. Good results have been obtained by each of these methods. Medical treatment of anthrax is of no avail except in the sub-acute form in cattle and horses. In such cases the external tumors may be cauterized and subsequently treated with injections of tincture of iodine. The affected animals should also be given diffusible stimulants by the mouth. In the prevention of anthrax, the main reliance of the stockman is to be placed in vaccination. Anthrax vaccine may now be purchased of wholesale druggists, and has proved very efficient in the prevention of the disease. The most important sanitary measure to be adopted in case of an outbreak of anthrax is the immediate and complete destruction of animal carcases. This is best accomplished by burning. If anthrax carcases are not destroyed, the contagion may be spread in the soil and water, and may also be carried by flies, buzzards, dogs, and other carnivorous animals. The thorough sterilization of hair, wool, and animal skins by steam, dry heat, or otherwise, will prevent the infection of man from handling these products.

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AN'THROPO- (from Gk. ἄνθρωπος, *anthrōpos*, man, human being). A combining form occurring at the beginning of many English words, especially scientific terms, and denoting that the word has something to do with *man* or *mankind;* e.g., *anthropo*-geography, the geographical distribution of mankind; *anthropo*logy, the science of man; *anthropo*phagy, man-eating, or cannibalism, etc.

AN'THROPO-GEOG'RAPHY (Gk. ἄνθρωπος, *anthrōpos*, man + γεωγραφία, *geōgraphia*, geography). A division of bio-geography which describes the distribution of the varieties of mankind, and depends upon anthropology as the science from which it derives its facts regarding the types of men. As a division of bio-geography it is concerned only with organic phenomena, forming a higher kind of natural history in which man, as an animal in relation to his physical environment, is subjected to the same kind of investigation as plants and the brute creation. Both in Germany and France the literature on the subject is assuming considerable dimensions. Professor Friedrich Ratzel was appointed to the chair of anthropo-geography at Leipzig, in 1866. His *Anthropo-geographie* (Stuttgart, 1899) is a type of this division of geography. A. J. and F. D. Herbertson, *Man and His Works* (London, 1899), gives in a popular form the principles of anthropo-geography. See GEOGRAPHY, ECONOMIC; ANTHROPOLOGY.

AN'THROPOID APES. See APE.

AN'THROPOL'ATRY (Gk. ἄνθρωπος, *anthrōpos*, man + λατρεία, *latreia*, worship). A term signifying, according to its derivation, the worship of man, and always employed in reproach. Thus, the early Christians accused the heathen of anthropolatry because in their mythology men were represented as exalted among the gods, although an *apotheosis* (q.v.) was in these cases alleged by their worshipers; and the heathen retorted the charge of the worship of Christ, the reply to which was the assertion of his divinity. But the term is chiefly known in ecclesiastical history in connection with the employment of it by the Apollinarians against the orthodox Christians of the fourth and fifth centuries, who in worshiping Christ worshiped, as was affirmed, only a man in whom God dwelt. See APOLLINARIS.

AN'THROPOL'OGY (Gk. ἄνθρωπος, *anthrōpos*, man + λόγος, *logos*, discourse, science). The science of man. Anthropology is the youngest of the sciences and borrows methods from all, though the object matter—the human genus—is so far distinct as to require special treatment. This may be illustrated by noting the relations among the older sciences determined by their respective phenomena or object matter. In astronomy the objects of study are stellar and planetary bodies arranged in systems controlled by gravity; in chemistry, the objects are substances affected by gravity and also by affinity; in phytology, or botany, the same factors remain and vitality is added; in zoölogy, the objects are subject to the laws of gravity, affinity, and vitality, while motility is added; and in anthropology, all the simple factors remain, yet they are subordinate to the special factor of mentality which gives character to the science. In view of this relation it becomes clear that the course of development of the sciences from astronomy to anthropology is the normal one of passage from the simple to the complex. The same relation indicates that interdependence of the sciences which makes anthropology the debtor of the older branches of knowledge for methods of weighing and measuring, and of locating and tracing, yet leaves each older science practically independent of those younger, and all measurably free of the youngest science except in so far as it reveals the laws of thought, on which all knowledge is founded. Accordingly, the older sciences have coöperated to define and establish certain laws which may be styled the cardinal principles, viz.: the indestructibility of matter, the persistence of motion, the development of species, and the uniformity of nature; but it remained for anthropology (despite a definite suggestion by Bacon) to establish the complementary principle of the responsivity of mind.

At the outset anthropology was little more than an extension of zoölogy to a distinct genus, and the methods were shaped accordingly. As the study of structures was pursued, comparative anatomy made useful progress, and many homologies between the genus Homo and both simian and pithecoid genera were discovered; later the methods and objects of measurement were extended, and anthropometry became prominent in scientific thought and literature; and during recent years the study of structures and functions of the human body has taken definite form under the term somatology (q.v.). Concurrently the study of functions, especially those of neural and cerebral character, has made great progress under the designation of experimental psychology. Meantime certain observers of men and tribes became impressed with the collective characteristics of the genus, characteristics so striking as to lead to the recognition of the group, rather than the individual, as the true unit of anthropology. This collective unit is called the *socius* by Giddings, and the *ethnos* or *demos* (according to the degree of development) by other investigators. The recognition of collective units was soon followed by recognition of collective functions, i.e., of the fact that what men *do* is of incomparably greater moment than what they merely *are;* and this led to the definition, largely by Powell, of the science of demology, or the science of collective human activity. The activities themselves have been classified as those pertaining respectively to arts, industries, laws, languages, and philosophies; and corresponding subsciences have been defined as esthetology, technology, sociology, philology, and sophiology. In this arrangement of the subdivisions of anthropology prehistoric technology becomes practically equivalent to the branch of knowledge long pursued as archæology, while sophiology embraces folk-lore and the study of primitive faiths or mythology; and when the activities are classified with a view to the definition of races and peoples, the product is ethnology. The general subject of anthropology is treated under the designation of the object matter of the science, MAN, and the subdivisions of the science are entered under their proper heads.

ANTHROPOLOGY, CRIMINAL. See CRIMINOLOGY.

ANTHROPOLOGY, THEOLOGICAL. A theological system which considers man as being the subject of sin and grace. It consequently considers his natural powers, so far as these relate to moral action and states—the moral intuitions, conscience, the affections, the will, habit—the original sin of Adam and its effects upon himself and upon his posterity, the corruption of nature, technically called "original sin," and the fall, heredity, the bondage of the will, and imputation. To these topics certain others are often added, such as the origin and antiquity of man, the origin of the soul (whether by creationism or traducianism), and the unity of the human race. See these various heads for discussion of the topic.

AN'THROPOM'ETRY (Gk. *ἄνθρωπος*, *anthrōpos*, man + *μέτρον*, *metron*, measure). A method of measurement pursued in anthropology. The primary measurements are those of the normal body at rest, and include stature, weight, circumference of head, reach (or span of extended arms), circumference and expansion of chest, length of arm and leg, sitting height, circumference of waist, limbs, hips, and shoulders, length of forearm and thigh, size of foot, length of fingers, size and position of ear, facial angle (i.e., degree of prognathism), shape of head, size and form of nose, position and attitude of eyes, etc. Of these elements of the human body, only a few are commonly regarded as of ethnic significance, or of use in describing and comparing peoples or races considered collectively; the elements commonly so employed comprise stature, size and shape of head, facial angle, relative length of limb, attitude of eyes, etc. Some or all of the other elements receive special consideration in studies and comparisons of selected classes of population, e.g., school-children of various ages or grades; and certain of the elements are customarily recognized in the study of individuals, such as athletes, criminals, etc. With these definitely quantitative measurements, other individual or typical attributes of the human body are commonly correlated; chief among these are color (of skin, hair, eyes, mucous membrane, nails, etc.), character of pelage (scalp hair, beard, axillary and pubic hair, body hair), local and general texture of integument, form and mobility of features, etc. Other measurements of common use in anthropologic studies are those of the skeleton, particularly the skull, jaws, and long bones. Various anthropologists, like Manouvrier and Deniker, have devised formulas for determining stature from the length of femur, tibia, humerus, and other long bones; and the relative dimensions of the different bones of the skeleton are commonly regarded as ethnic indications. The forms of certain bones are also deemed ethnic criteria; the flattening of the tibia (platycnemism) and the perforation of the humerus in the olecranon fossa have received especial consideration in this connection. The measurement of the skull has been developed into a system known as craniometry, which in some schools has been held to constitute a large if not controlling part of anthropology, although others regard the cranial measurements as expressing little more than individual variations of trifling value in ethnology and general anthropology. A leading feature in this aspect of anthropometry is the cranial index, i.e., the breadth of the skull in proportion to its length as viewed from above (in the norma verticalis); and three types are commonly defined as dolichocephalic or long-head, mesocephalic or round-head, and brachycephalic or broad-head varieties of the genus Homo, the ratios of breadth to length being about 70 : 100, 80 : 100, and 85 : 100, respectively.

Another important feature of the system is the capacity of the brain-case, measured by means of liquid or fragmental substances (water, glycerin, sand, fine shot, or small seeds), poured into the cavity and afterward weighed or gauged, or by aid of a thin, elastic, and impervious bag inserted through the foramen magnum and afterward filled with liquid; and connected with such determinations is the direct weighing or measurement of the brain itself. Still another feature is the facial angle, i.e., the angle subtended by the bones of face and forehead with the base of the cranium, viewed from the side (*norma lateralis*), or in vertical antero-posterior section (*norma mediana*). There are several modes of defining this angle, those of Camper, Cloquet, Jacquart, and Cuvier being best known; and the progressively increasing angle from the lower animals to the anthropoids, and thence from the lowest races to the highest type of humanity, is among the striking facts brought out by scientific inquiry. The facial index is another feature of modern anthropometry, and affords arbitrary but useful means of comparing crania of different types, while craniometric specialists have devised a series of points, lines, and angles serving to define cranial forms and types in great detail. Among the applications of anthropometry, in what may be called the static aspect, are those involved in the Bertillon system (q.v.) and related methods of bodily description for identification or other purposes, and among these that of identification by finger-prints (i.e., by the patterns of the papillaceous ridges which are peculiar to each individual), which was brought out in America by Gilbert Thompson and in England by Francis Galton, is of much interest.

During recent decades, what may be called the dynamic aspect of anthropometry has attained prominence, and the measurement of structures has been supplemented by measurement of functions, both periodic and special. Among the former are rates of respiration and pulsation, which vary with sex, age, and race as well as with individual characteristics and conditions; and various devices (including the plethysmograph, with its variants and improvements) have been devised to measure the interrelations between the periodic and special functions of the human body. The latter functions are too numerous and variable for ready treatment, though athletic records, the military step in various armies, the hours of labor in different countries and classes, the variation of faculty with race and culture, and other relevant material are gradually assuming systematic form. Among the most fruitful lines of measurement of human function are those of experimental psychology, pursued in America by Cattell, Royce, Baldwin, Scripture, MacDonald, Witmer, and others, for these open new vistas of relationship between structures and functions, between body and mind, and between the processes and the products of organic development in the human genus. The data obtained through anthropometry may be summarized under somatology (q.v.).

AN'THROPOMOR'PHISM (Gk. ἄνθρωπος, *anthrōpos*, man + μορφή, *morphē*, form). The application to God of terms which properly belong only to human beings. This may be done literally, teaching that God really has a body, as some (see AUDÆUS) have been accused of doing, with doubtful truth. Some philosophers (Hobbes, Forster, Priestley) have ascribed to God a sort of subtle body. Figuratively, anthropomorphism is employed in the Scriptures, as when God is said to have eye or arm. Anthropopathism ascribes to God human affections and passions, and is the more common form of anthropomorphism. The whole tendency arises from the difficulty of conceiving of God as he is in himself, and from the teachings of Christianity, which seeks to reveal God to men, and employs terms which are capable of being understood. While it is susceptible of abuse, it has a fundamental justification in the fact that if there is to be any knowledge of God at all, man must be assumed to possess a like nature with God. We are made "in his image." The extreme of recoil from anthropomorphism is found in those philosophers (e.g., Fichte and his school) who reject the personality of God as anthropomorphic. Schleiermacher, following Spinoza, thought that there was something in God far higher than personality, which he regarded as a human limitation. Another term used to express the same as above is Anthropopathism.

AN'THROPOPH'AGY (Gk. ἀνθρωπος, *anthrŏpos*, man + φαγεῖν, *phagcin*, to eat). Cannibalism; the eating of human flesh. See CANNIBALISM.

ANTHU'RIUM. See ARUM.

ANTHYL'LIS. See KIDNEY VETCH.

AN'TI, or CAMPA. An important and warlike tribe of Arawakan stock, occupying the forests at the head waters of the Ucayali River, on the eastern slope of the Andes, in southern Peru. The eastern division of the Inca empire took its name of Antisuyu from them. They are of good physique and pleasant countenance, and wear their hair long and flowing, with a poncho belted around the waist as their principal garment. The women are skillful weavers of wild cotton, and the men are good metal workers. They cultivate the ground to some extent, and delight in taming animals from the forest.

AN'TIA'RIA AND ANT'JAR. See UPAS.

ANTIBES, äɴ'têb'. A fortified seaport in the department of Alpes-Maritimes, in the southeast of Provence, France, and the general port of communication with Corsica. It stands on the east side of a small neck of land called La Garoupe, lying west of the mouth of the Var, in a fertile district (Map: France, N 8). The harbor is only serviceable, however, for small craft. It possesses a naval school, and has considerable trade in olives, dried fruits, salt fish, oil, perfumery, etc. The anchovies prepared at Antibes are held in high esteem. The environs of the town are bright with vineyards and orchards, while its gardens of roses and jasmine furnish material for the extensive perfume manufactories of the town. Pop. in 1896, 4956; commune, 9329; in 1901, 5512; commune, 10,947.

Antibes is a very old place, having been founded under the name of Antipolis by a colony of Greeks from Massilia (Marseilles), of which it became a dependency. In the time of Augustus it was elevated to the rank of a *municipium*, and must have attained a high degree of prosperity, if we are to judge from the ruins of theatres and aqueducts that still exist. After the disintegration of the Roman Empire, Antibes shared the fate of all cities in that region, becoming subject to successive tribes of barbarians from the North. In the ninth century it was destroyed by the Saracens; in the sixteenth century it was fortified by Francis I. and Henry IV.; during the War of the Austrian Succession, it sustained a siege of three months (1746); and in recent times gained some celebrity from having closed its gates against Napoleon on his return from Elba. Consult Vinson, "Le port et le quartier maritime d'Antibes," in *Revue Maritime*, Volume CXLVI. (Paris, 1900).

AN'TIBURGH'ER. See BURGHER.

AN'TICANT, DR. PESSIMIST. An appellation of Thomas Carlyle (q.v.).

AN'TICHLOR (*anti* + *chlorine*). Any one of several substances (e.g., sodium sulphite, sodium bi-sulphite, sodium hyposulphite, or calcium sulphide) used by manufacturers of linen and cotton fibre and paper pulp to remove the last traces of free chlorine that had been generated from the hypochlorite used in bleaching the materials mentioned. Free chlorine has a tendency slowly to disintegrate the material unless removed.

AN'TICHRIST (Gk. 'Αντίχριστος, *Antichristos;* from ἀντί, *anti,* against + Χριστός, *Christos,* Christ). A name which occurs only in the Epistles of John, but which, in all likelihood, designates the final New Testament form of a popular belief, whose rise is to be found in later Judaism and which was appropriated with various modifications by biblical writers.

Its source is a question of some debate. Most probably, however, it lay in the popular convictions aroused by the constant announcement of the divine purpose to punish Israel's sin by giving her into the hands of heathen nations, but to recover her by force from their power when her spiritual discipline had been accomplished. The repeated carrying out of this policy, even in earlier Jewish history, evidently impressed the popular mind with the idea of an essential opposition between the heathen nations and the people of God, the final outcome of which was yet in the future, but must be in favor of the chosen people. Such an impression may have been aided by the instinctive natural beliefs in the struggle of darkness with light and chaos with order (Bossuet); but, in view of the above unique line of revelation and experience peculiar to the Jewish people, it is quite gratuitous to make such general beliefs the definite source of such a distinctive popular conviction.

As the later revelation emphasized the element of punishment to be administered to the heathen nations by announcing that God would not only recover his people when their discipline was finished, but would chastise the nations for any attempt on their part to overreach the disciplinary mission given them, the popular idea of the hostility of the nations to the people of God was naturally increased. The primary form of this popular conception is evidently used by Ezekiel as a basis for his prophecy concerning the consummation of Israel's restoration, in which he describes the nations of the world as assembled under the leadership of "Gog of the land of Magog" for final battle against Israel (Ezekiel xxxviii, xxxix; see also Zechariah xii to xiv, where the prophet foretells the gathering together of all the nations of the earth to fight against Jerusalem, and the Lord's going forth in turn to fight against them).

In the experience of the Jews under Antiochus Epiphanes, however, the popular conception of this struggle made a distinct advance, in which the opposition was concentrated in a single personage, and all idea of disciplinary mission toward Israel was lost sight of in the conviction of an inherent enmity against the people of God. This secondary form appears in the eschatological prophecies of the Maccabean Book of Daniel (Daniel vii to ix, xi, xii, in which are given the vision of the beast with the ten horns, triumphed over by the "Ancient of Days," and the vision of the goat with the horn between the eyes who warred against the holy city but was finally himself destroyed).

Naturally, as the idea of a personal Messiah increased in definiteness, this popular belief in a personal adversary would grow stronger, especially when we consider the long-continued influence on Jewish thought of the Daniel prophecies. We can believe, therefore, though the Jewish apocryphal literature antedating the Christian era does not distinctly show it, that the conception of an Antimessiah was more or less current in Judaism before the rise of Christianity. This Antimessianic conception is appropriated by New Testament writers, with modifications due to the newer revelations of truth in the Gospel and apostolic times, particularly those which substituted the spiritual for the national idea of the kingdom of God, and so emphasized the significant distinction between righteousness and sin. So we see Paul's statement concerning the advent and mission of the Man of Sin and his final destruction by Christ (II. Thessalonians ii : 1-12: "For the day of the Lord will not come, except . . . the Man of Sin be revealed, . . . who opposeth and exalteth himself against all that is called God . . . whom the Lord Jesus shall slay with the breath of his mouth . . . whose coming is according to the working of Satan with all power and signs and lying wonders . . . and deceit of unrighteousness"), where, however, in the deceiving character of his mission, there is brought out a new idea—an idea which is frequently applied by Paul to those who opposed him and his gospel (Acts xx : 30; II. Corinthians xi : 13; I. Timothy iv : 1, 2). So also we see the various forms of statement in the Book of Revelation regarding the Beast and the Dragon (compare Revelation xi to xiii, xvi, xix, xx, in which we are told of "the beast that cometh up out of the abyss," who overcomes "the two witnesses," and of the "red dragon having seven heads and ten horns," warring against the woman and her child and destroyed by Michael and his angels; also of the "beast coming up out of the sea, having ten horns and seven heads," ministered to by the "beast coming out of the earth," with "two horns like unto a lamb," and finding his identification in the mystical number "six hundred and sixty and six"). The idea of the deceiving mission of the adversary, however, is in this book specifically pictured in the separate figure of the False Prophet, "who wrought signs wherewith he deceived them that had received the mark of the beast" (Revelation xvi : 13, xix : 20, xx : 10, though compare also xii : 9 and xiii : 14 for the same characteristics in the Dragon and the Beast). In this figure there is a return to the earlier personal idea of the Antimessiah, and, at the same time, an advance to the final New Testament form found in the Johannine Epistles, where the teaching of false doctrines is personified in the term Antichrist (I. John ii : 18, 22; iv : 1-3: "Many false prophets are gone out into the world . . . Every spirit which confesseth not Jesus . . . this is the spirit of Antichrist;" II. John 7: "This is the deceiver and the Antichrist").

This Antimessianic conception is clearly appropriated by Jesus as a form for his eschatological statements regarding those who shall appear in opposition to his cause (Mark xiii : 5, 6: "Many shall come in my name, saying, 'I am he:' and shall lead many astray;" see also verses 21, 22: "There shall arise false Christs and false prophets, and shall shew signs and wonders, that they may lead astray, if possible, the elect"). In these statements Jesus seems, in the term "false," to have distinctly introduced a new idea, which does not appear to have been present in the popular beliefs. This would, however, have been quickly intelligible to those of his hearers who recalled the false prophets of Jewish history, whose ability to deceive the false Christs were to reproduce. From the tradition of Jesus' words may have come the idea of falseness in Paul's statement regarding the Man of Sin and his own gospel opponents; from its definite form in the written gospel is quite certain to have come John's statement regarding the false prophet, if not his use of the term itself.

The idea of Antichrist persisted into the post-apostolic times, in both Jewish and Christian circles. In the former it returned to its earlier national form; in the latter it carried forward the final New Testament form of the teaching. Consult: *Discussions;* H. Gunkel, *Schöpfung und Chaos* (Göttingen, 1895); W. Bousset, *The Antichrist Legend,* English translation (London, 1896); M. Friedländer, *Der Antichrist in den vorchristlichen jüdischen Quellen* (Göttingen, 1901).

AN'TICLI'MAX (Gk. ἀντί,, *anti,* against + κγῖμαξ, *klimax,* a ladder, climax). In rhetoric, an abrupt declension by a writer or speaker from the dignity to which his idea has attained. Though the anticlimax is to be avoided in serious discourse, where it leads to bathos, it is employed with fine effect in ridicule and satire. Pope, Addison, and Fielding were masters in this art of unexpected descent. Pope, for example, thus writes of Queen Anne at Hampton Court:

> "Here thou, great Anna! whom three realms obey,
> Dost sometimes counsel take—and sometimes tea."

AN'TICLI'NAL AX'IS. See ANTICLINE.

AN'TICLINE (Gk. ἀντί, *anti,* against, opposite + κλίνειν, *klinein,* to incline). In geology, a term applied to that form of rock-folding in which the opposite sides or limbs of the fold slope downward and away from the crest of the fold. Anticlinal axis is the axis or crest of such a fold. The anticline may be compared to the ordinary gable-roof—the axis corresponding to the ridge of the roof, while the limbs of the anticline correspond to the slopes of the roof. When the anticlinal axis lies in a horizontal plane, which, however, is seldom the case, the layers composing the limbs of the fold are, after erosion, exposed in parallel rows on either side of the axis; those layers of earlier age, and consequently of lower stratigraphic position, occupying positions nearer to the axis, and *vice-versâ.* Thus, in an anticlinal ridge the crest of the ridge is occupied by rocks of a geologic age earlier than that of the rocks forming the flanks of the ridge. This condition is due largely to the fact that the rocks near the axis have suffered greater compression and are consequently harder than are those of the flanks.

The supplementary condition to that of the anticline, or up-fold, is observed in the *syncline,* or down-fold, and indeed these two types of folds are usually found in close association; the features of anticlines being, however, reversed in synclines. When anticlinal and synclinal axes are tilted and eroded, the component layers outcrop in alternating convergent and divergent series to form zigzag ridges with intervening "canoe-valleys," a type of structure which is well developed in Pennsylvania. The term *anticlinorium* is applied to a compound anticline, and the term *synclinorium* to a compound syncline. Anticlines are intimately associated with the occurrence of natural gas, it having been demonstrated that the gas occurs at those portions of the gas-bearing stratum that have been thrust upward to form an anticlinal axis or dome. See DIASTROPHISM; GEOLOGY; and for illustration, see plate accompanying the latter title.

AN'TI-CORN'-LAW LEAGUE. An organization in Great Britain which had much to do with the ultimate repeal of the Corn Laws. The League, in which Richard Cobden was the leading spirit, was formed at Manchester, March 20, 1839. With the aid of Mr. Cobden and Mr. Bright, as well as many others, the League undertook what in our day would be termed a campaign of education. Meetings were held in all corners of the kingdom, and vast quantities of tracts and other literature bearing upon the Corn Laws were distributed broadcast. So thorough was the work and so timely, that a few years sufficed to accomplish the purpose of the League. It was through the discussions of this organization rather than the debates of Parliament that the nation was prepared for the change of policy which took place in 1846. See articles CORN LAWS; FREE TRADE; TARIFF.

AN'TICOS'TI (N. Amer. Ind. *Naticotek*). A barren island in the province of Quebec, Canada, dividing the Gulf of St. Lawrence into two channels, and situated between lat. 49° and 50° N. and long. 61° 40′ and 64° 30′ W., forty miles north of Cape Gaspé (Map: Canada, S 7). It is 135 miles long, with a maximum width of 40 miles; has an area of 3147 square miles. It is almost destitute of harbors, the north shore being mountainous, and the south low and beset with shoals, while the neighboring currents are capricious. Ellis Bay, to the west, and Fox Bay, in the northwest, are the only safe harbors. The climate is severe, while the surface is an alternation of rocks and swamps. The principal inhabitants are the keepers of the lighthouses situated at different parts of the coast. Pop., 250. Near the island there are considerable salmon, trout, cod, and herring fisheries. It is a favorite resort for seal and bear hunting, and in 1896 was acquired as a game preserve by M. Menier, a Parisian manufacturer. The most extensive peat deposits in the Dominion are found in Anticosti. Marl also exists in most of the small lakes and ponds along the coast. In 1873, divided into twenty counties by a land company, Anticosti was the scene of a disastrous colonization scheme. The colonists who were attracted by specious promises, had to be removed to the mainland, after suffering severe privations. The rocks of Anticosti are of great interest to the geologist, as they comprise a series of shale and limestone beds that constitute an uninterrupted transition formation between the Ordovician and Silurian systems such as is known in few other localities. Consult: Logan, *Geological Survey of Canada, Report of Progress from its Commencement to 1863,* with atlas (Montreal, 1863-65); Billings, "Catalogue of the Silurian Fossils of Anticosti," *Geological Survey of Canada* (Montreal, 1866). See SILURIAN SYSTEM.

AN'TICY'CLONE. See STORM.

ANTICYRA, ăn-tĭs'ĭ-rȧ. A city of Phocis on the Corinthian Gulf, famous for the hellebore which grew in the neighborhood. The modern town is Aspra Spitia. There were two other towns called Anticyra, one in Locris and one in Malis.

AN'TIDOTE (Gk. ἀντίδοτος, *antidotos,* given against, from ἀντί, *anti,* against + διδόναι, *didonai,* to give). A term applied in medicine to any substance capable of neutralizing the action of a poison, or, in general, of any other substance.

The action of antidotes may be due either to their chemical properties, or to their having physiological effects that are the opposite of those which they are intended to counteract. As an example of chemical antidotes it may be mentioned that acids antidote alkalies. As an example of physiological "antagonism" may be mentioned the case of morphine and atropine. In cases of poisoning in which no true antidote is known, the treatment resorted to is necessarily of a mechanical nature. Such cases, it must be observed, are in the majority; so that the stomach pump, emetics, and purgatives, play an important rôle in the treatment of most cases of poisoning. The following is a list of ordinary poisons, with their antidotes and other factors employed in counteracting them.

Arsenic, Paris Green, "Rough-on-Rats."—A tablespoonful of "dialyzed iron" (sold in all drug stores) should be given to the patient every half hour for four doses. This should be followed by a dose of castor oil.

Phosphorus, Matches, "Rat-paste."—Emetics, a large amount of mucilage of gum arabic, and a purgative dose of Epsom salts, should be administered in cases of poisoning from these substances. Oils or fats should be avoided.

Caustic Potash (Lye), Washing Soda, or *Ammonia.*—The action of these may be counteracted by diluted lemon juice, or by a mixture of two parts of vinegar with one of water. The acid should be followed by large amounts of sweet oil.

Oxalic Acid.—Give the patient water containing such alkaline substances as chalk, whiting, or whitewash scraped from the wall. Then give a dose of castor oil or of Epsom salts.

Carbolic Acid.—A good chemical antidote for this is Epsom salts (magnesium sulphate), or any other soluble sulphate; for, on entering the blood, these form with carbolic acid harmless chemical compounds. Give the patient also large amounts of sweet oil, white of egg, and stimulants.

Carbonic Acid Gas, Carbonic Oxide, Coal Gas.—Fresh air should be supplied; artificial respiration should be employed, thirty drops of aromatic spirits of ammonia should be given every half hour for three doses, and then one ounce of well diluted whisky every three hours, for three doses.

Nicotine.—The patient should be placed flat on the back and emetics, tea, and stimulants should be administered. A hypodermic injection of one-fortieth of a grain of nitrate of strychnine has a very good effect.

Alcohol.—The stomach pump may be used early by the attending physician. Thirty grains of powdered ipecac should be given to the patient as an emetic, then thirty drops of aromatic spirits of ammonia every half hour until the pulse has become full and rapid. Then cold should be applied to the head and heat to the extremities.

Chloral, "Knock-out-drops."—Thirty grains of ipecac in water should be given to the patient as an emetic, and a hypodermic injection of one-twentieth of a grain of strychnine. Friction of the surface, application of warmth, and artificial respiration are effective.

Corrosive Sublimate (Bichloride of Mercury), Bed Bug Poison, White Precipitate.—Thirty grains of powdered ipecac in warm water should be given to the patient as an emetic, then the whites of a dozen eggs, and a hypodermic injection of morphine.

Sulfonal.—The stomach pump and artificial respiration should be employed, and plenty of hot coffee should be given to the patient.

Opium, Morphine.—An emetic or the stomach pump should be employed first of all; then the patient should be made to inhale ammonia and half a grain of permanganate of potash should be given every hour. Artificial respiration should be employed, two ounces of hot black coffee should be injected into the rectum, and rubbing and gentle shaking should be employed to keep the patient awake—avoiding the exhaustion of walking, flagellation of the calves, etc. A subcutaneous injection of atropine, or thirty drops of tincture of belladonna repeatedly given by the mouth, will have a powerfully counteracting effect by stimulating the respiratory centre.

Strychnine.—The stomach pump should be employed as early as possible, and twenty grains of zinc sulphate should be given, or thirty grains of powdered ipecac, in warm water, as an emetic. Then twenty grains of chloral and thirty grains of bromide of sodium, dissolved together in two ounces of hot water, should be injected into the rectum. In case convulsions occur, anæsthesia may be produced by the use of chloroform. Chloral, which is in a sense antagonistic to strychnine, is considered a valuable antidote. In any case, twenty grains of sodium bromide should be given by the mouth every hour.

Cocaine.—The patient should be placed flat on the back, and whisky and hypodermic injections of strychnine—one-fortieth of a grain each—should be given.

Phenacetin.—Whisky and digitalis should be given.

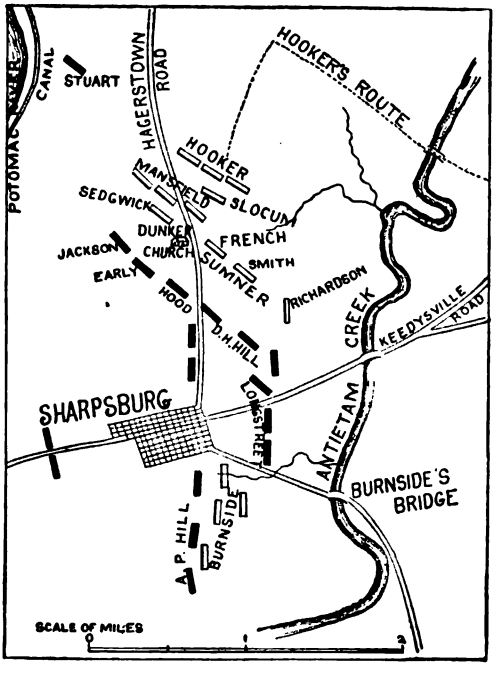
Turpentine.—An emetic, mucilage of gum arabic, Epsom salts, and a hypodermic injection of morphine, should be given to the patient.

Tansy.—Thirty grains of powdered ipecac in warm water as an emetic, and a dose of castor oil, should be given to the patient.

In the case of *unknown poisons*, it is advisable to give two teaspoonfuls of chalk mixed with water, four eggs beaten up with a glass of milk, and some whisky. The stomach pump, too, may be useful, and in case these measures give no relief, artificial respiration should be employed. Of course, the physician should endeavor to ascertain the nature of the poison and direct the treatment accordingly. See POISON.

AN'TI-EMET'IC (Gk. ἀντί, *anti,* against + ἐμεῖν, *emein,* to vomit). Any remedy which tends to arrest nausea and vomiting. No class of drugs is more unreliable in action, and rest and quiet are at times much more efficient than the administration of an anti-emetic. Drugs may act upon the vomiting centre, as morphine or hydrocyanic acid, or on the nervous system, or locally on the stomach. Of the local remedies, external applications of counterirritants or of cold may succeed. Emetics act by removing the cause for continued vomiting; lavage, or washing the stomach, in the same way. Cold carbonated waters, alcohol, especially dry champagne, chloroform, opium, bromides, chloral hydrate, and arsenic are at times used successfully. Ipecac, dilute hydrocyanic acid, small doses of calomel, cerium oxalate, cocaine, carbolic acid, nux vomica, and the alkalies are among the most reliable anti-emetics. Many drugs at times succeed where others fail. In any case, it is necessary to determine the cause of vomiting before it is possible to select a proper anti-emetic. For example, the gastric disturbance may result from excessive acidity of the stomach contents, when an alkali or simple dilution with water may give relief; or it may be of cerebral origin, in which case such drugs as the bromides or opium may be required. If due to gastric irritation, a local anæsthetic may be efficacious; if to chronic alcoholism, some form of astringent, bitter, or stimulant, in some cases, may relieve the vomiting. See EMETIC.

ANTIETAM, ăn-tē′tam. BATTLE OF, sometimes called THE BATTLE OF SHARPSBURG. A sanguinary conflict fought on September 16 and 17, 1862, between a Federal force of about 75,000 under General McClellan and a Confederate force of about 40,000 under General Lee. After having driven McClellan from the Peninsula and Pope from the Rappahannock back upon Washington, Lee took the offensive and crossed the Potomac, with the intention of invading Pennsylvania, and with hopes of inducing Maryland to join the Confederate cause, and possibly of forcing a satisfactory peace upon the Federal Government. Dividing his army, he sent Jackson against Harper's Ferry (q.v.), which surrendered with 12,500 men on September 15th. Meanwhile, on McClellan's advance from Washington, Lee took up a strong position at Sharpsburg, on the west side of Antietam Creek, and fortified the passes of South Mountain. These McClellan forced on the 14th (see SOUTH MOUNTAIN, BATTLE OF), and on the 15th the two armies stood facing each other across the Antietam. McClellan delayed his attack, and a part of Jackson's forces rejoined Lee; but on the afternoon of the 16th the Federal commander ordered Hooker across the creek, where the latter skirmished until dark. On the morning of the 17th the Federal right and centre, under Generals Hooker, Mansfield, and Sumner, though their attacks were badly concerted, forced back the Confederate left under Jackson, who had arrived from Harper's Ferry during the night of the 16th; while the Federal left, under Burnside, which had been unable to cross the creek until 1 P.M. owing to the stubborn opposition of the Confederates at "Burnside's Bridge," attacked at 3 P.M. the Confederate right under General A. P. Hill, and fought stubbornly until dark without obtaining any decisive advantage. McClellan decided not to renew the battle on the following day, though the Confederate right made several assaults upon Burnside's position, and during the night of the 18th General Lee retreated unmolested across the Potomac. The Federals lost in killed, wounded, and missing about 12,500, and the Confederates about 11,000. It was one of the bloodiest battles of the Civil War, more men being killed on September 17 than on any other one day between 1861 and 1865. Tactically, it was a drawn battle, though military critics are almost unanimous in the verdict that McClellan, who brought only a part of his force into action, made many grave blunders, while the generalship of Lee, who utilized nearly every man, was almost faultless. Strategically, however, it was an important Federal victory, since it forced Lee to abandon his aggressive campaign and retreat into Virginia. "Without McClellan's victory," says Rhodes, "the emancipation proclamation would have been postponed and might never have been issued." Consult: *Battles and Leaders of the Civil War*, 4 volumes (New York, 1887); Ropes, *Story of the Civil War*, 2 volumes (New York, 1894-1898); Palfrey, *The Antietam and Fredericksburg* (New York, 1882); *McClellan's Own Story* (New York, 1887); and Michie, *General McClellan* (New York, 1901).



ANTIFEBRIN. See ACETANILID.

AN′TI-FED′ERALISTS. A political party in the United States opposed to the so-called Federalists. As a matter of theory and analysis, the Federalists believed in a national system of government, while the Anti-Federalists believed in a decentralized and strictly federal system of government. The Federalists had the advantages of possessing a positive programme, and of gaining the first two points in the conflict when the national constitution was adopted and when they committed the national government to the exercise of such extensive powers as the creation of a national bank. The Anti-Federalists were thus merely a party of political opposition to the party in power. When, however, the Federalists, in the Alien and Sedition Acts (q.v.), seemed to encroach both upon the liberty of the individual and upon the jurisdiction of the States, the opposition of the Anti-Federalists became acute and their fundamental propositions were stated in the Virginia and Kentucky Resolutions (q.v.). This crisis resulted in the triumph of the Anti-Federalists under the leadership of Jefferson in the election of 1800; but soon thereafter the leaders of the party began to abandon its original creed of the strict interpretation of the Constitution and the narrow limitation of the powers of the national government. The first step in this direction was the purchase of Louisiana; and when finally the Federalist party was driven entirely out of existence, its characteristic principles remained effective as the chief principals of the Anti-Federalist party. The party was named the Republican party, then Democratic-Republican, and finally Democratic party. Consult Ostrogorski, *Democracy*, vol ii. (New York, 1902); and see DEMOCRATIC PARTY; FEDERALISTS; REPUBLICAN PARTY; UNITED STATES.

AN′TIGO. A city and county seat of Langlade Co., Wis.; on the Spring Brook River, and on the Chicago and Northwestern Railroad, 207 miles northwest of Milwaukee (Map: Wisconsin, D 3). It is in a productive agricultural and timber region, of which it is the commercial centre, and has extensive manufactures of various kinds of woodenware, besides flour mills, breweries, foundries, and railroad shops. Settled about 1878, Antigo was incorporated in 1884. The government is administered under a general State law, which provides for a mayor, biennially elected, and a municipal council. Pop., 1890, 4424; 1900, 5145; 1905, 6663.

ANTIG′ONE (Gk. Ἀντιγόνη). (1) In the Theban legend, daughter of Œdipus by his mother, Jocasta, and sister of Eteocles, Polynices, and Ismene. Her story existed in various forms. The Athenian dramatists represented her as accompanying her blind father, Œdipus (q.v.), in his exile, until his mysterious death at Colonus in Attica. When her brother Polynices led the Seven against Thebes, she was in the city, and after the mortal duel between Eteocles (q.v.) and Polynices, she disregarded the decree of Creon, that the latter should be left unburied. Caught in the act of burying her brother, she was condemned to be immured in a tomb, where she hanged herself. Thereupon her betrothed, Hæmon, son of Creon, committed suicide. Antigone's filial and sisterly devotion are depicted by Sophocles in the *Œdipus at Colonus*, and *Antigone*. She appears in Æschylus's *Seven Against Thebes* and Euripides's *Phœnissæ*. She was also the subject of a lost play of Euripides, seemingly ending with her marriage to Hæmon. (2) ANTIGONE, daughter of Eurytius, and wife of Peleus, who hanged herself upon hearing a false report of her husband's marriage to Sterope, daughter of Acastus. (3) ANTIGONE, daughter of Laomedon, and sister of Priam, who offended Hera by comparing her own beauty to that of the goddess. Hera turned her hair into snakes, which so tormented her that the gods, in compassion, changed her into a stork.

ANTIG′ONUS (Gk. Ἀντίγονος, *Antigonos*), called the 'One-Eyed' (c.380-301 B.C.). One of the generals of Alexander the Great, and a member of a distinguished Macedonian family. His father's name was Philip, though whether this was Philip of Elymiotis, is uncertain. When Alexander died and his Empire was divided, Antigonus received the provinces of Greater Phrygia, Lycia, and Pamphylia. Being accused of disobedience by Perdiccas, who was aiming at sole control of the lands left by Alexander, he entered into an alliance with Craterus, Antipater, and Ptolemy, and made war on Perdiccas. Perdiccas soon died, but the war was prosecuted against Eumenes and the party of Perdiccas. After the death of Antipater, in 319 B.C., Antigonus began to carry out his plans for obtaining sole sovereignty of Asia. The war was continued with varying success, and many alliances were made and broken. At one time during the long struggle, Antigonus was supreme in Asia and assumed the name of king. He himself invaded Egypt, and his son Demetrius Poliorcetes carried the war into Greece, but both were compelled to withdraw again to Asia. In 301 B.C. the forces of Antigonus and Demetrius Poliorcetes were overwhelmed by Lysimachus and Seleucus at Ipsus, in Phrygia, Antigonus being killed, at the age of about eighty-two.

ANTIGONUS (Gk. Ἀντίγονος, *Antigonos*). A king of the Jews, son of Aristobulus II., and the last of the Hasmonean dynasty. About 40 B.C. he drove out Herod from Jerusalem and assumed the royal power. Herod fled to Rome, whence, with the aid of Octavius and Antony, he returned in 37 B.C. to regain the throne. At the request of Herod, Antigonus was put to death at Antioch in the same year.

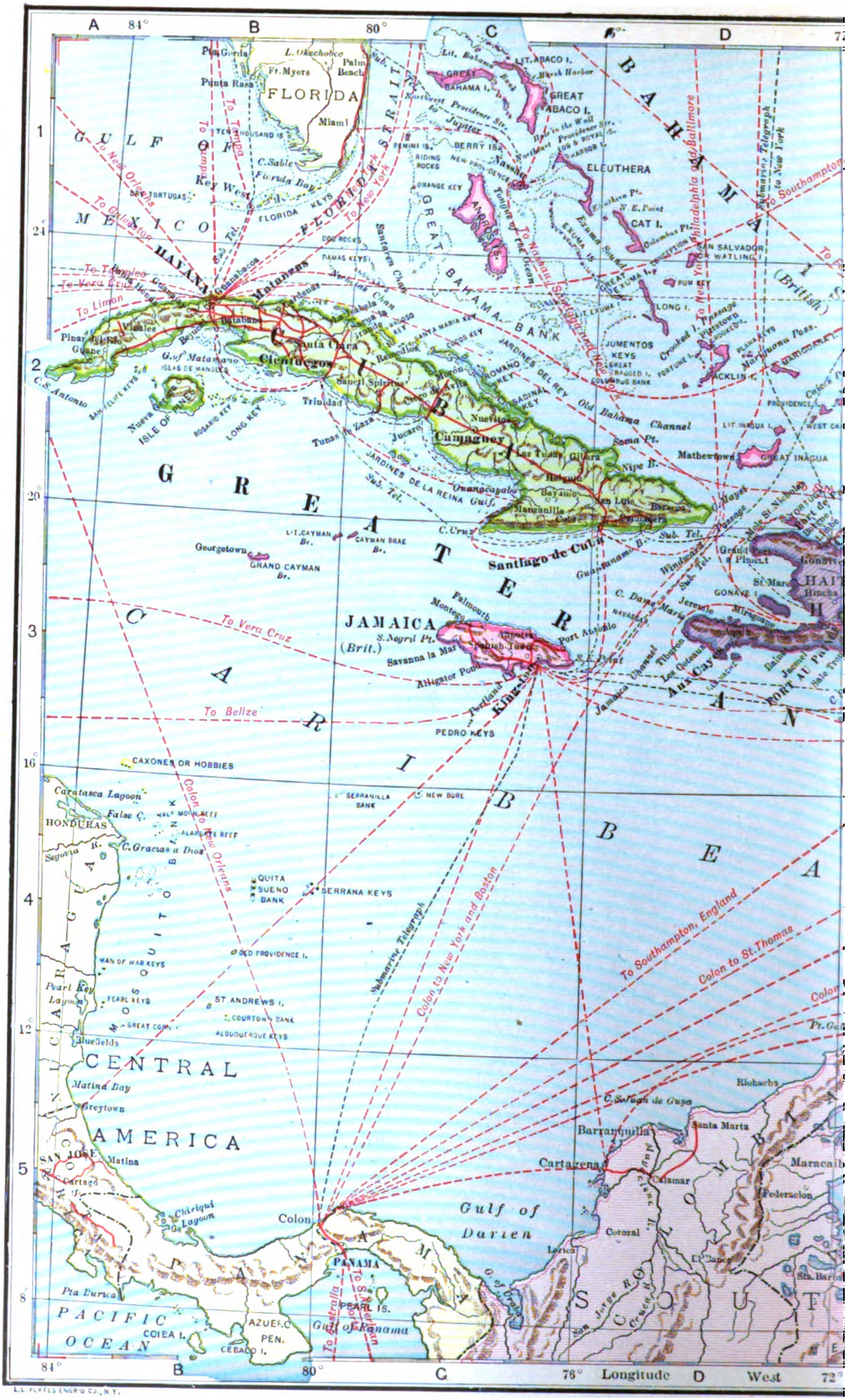
ANTIGONUS DO′SON (?-220 B.C.). A king of Macedonia, from 229 to 220 B.C., called Doson (Gk. Δώσων, about to give), it is said, because he was "always about to give, and never did." He was the grandson of Demetrius Poliorcetes, and on the death of Demetrius II. of Macedonia became guardian of the latter's son Philip. He himself, however, married the widow of Demetrius and became king. He sided with the Achæan League against the Spartans, whom, under King Cleomenes, he defeated at Sellasia in 221.

ANTIGONUS GONA′TAS (319-239 B.C.). A son of King Demetrius Poliorcetes of Macedonia, and grandson of the great Antigonus. On his father's death, B.C. 283, he took the title of king, but did not secure the full power until 276 B.C. There were various claimants to the throne, and he was twice expelled from his dominions by a hostile force from Epirus. He died in 239 B.C.

ANTIGONUS OF CARYS′TOS. A Greek author. He lived at Athens and Pergamum about the middle of the third century B.C. Besides several biographies of celebrated contemporary philosophers, he wrote a number of stories. See Westermann's *Scriptores Rerum Mirabilium Græci* (Brunswick, 1839), and the first volume of Keller's *Rerum Naturalium Scriptores Græci Minores* (Leipzig, 1877).

ANTIGONUS OF SO′KO. According to the Mishna, a scholar and the disciple of Simon the Just. As it is probable that the latter is the second high-priest of the name and lived in the first part of the second century B.C., the approximate date of Antigonus is probably 180 B.C. The following sentiment of his has been preserved: "Be not like slaves who serve their master for their daily food; be like those who serve their master without considering the reward, and let the fear of God be with you." Pirke Aboth i. 3. It is not impossible that Antigonus was influenced by Greek thought. But the noble motto represents a legitimate development of prophetic teaching not infrequently met with in later Jewish thought.

ANTIGUA, ăn-tē′gwȧ. One of the British West Indian Islands, the most important of the Leeward group, situated in lat. 17° 6′ N. and long. 61° 45′ W. (Map: West Indies, R 6). It covers an area of 108 square miles and has a population of (1901) 36,119, chiefly negroes, with only 5000 whites. The surface is rugged, and the coasts are highly indented and surrounded with rocks and shoals. The soil is very fertile, especially in the interior; but there is a scarcity of water on the island, which necessitates the construction of reservoirs and irrigation works. The chief products of the island are



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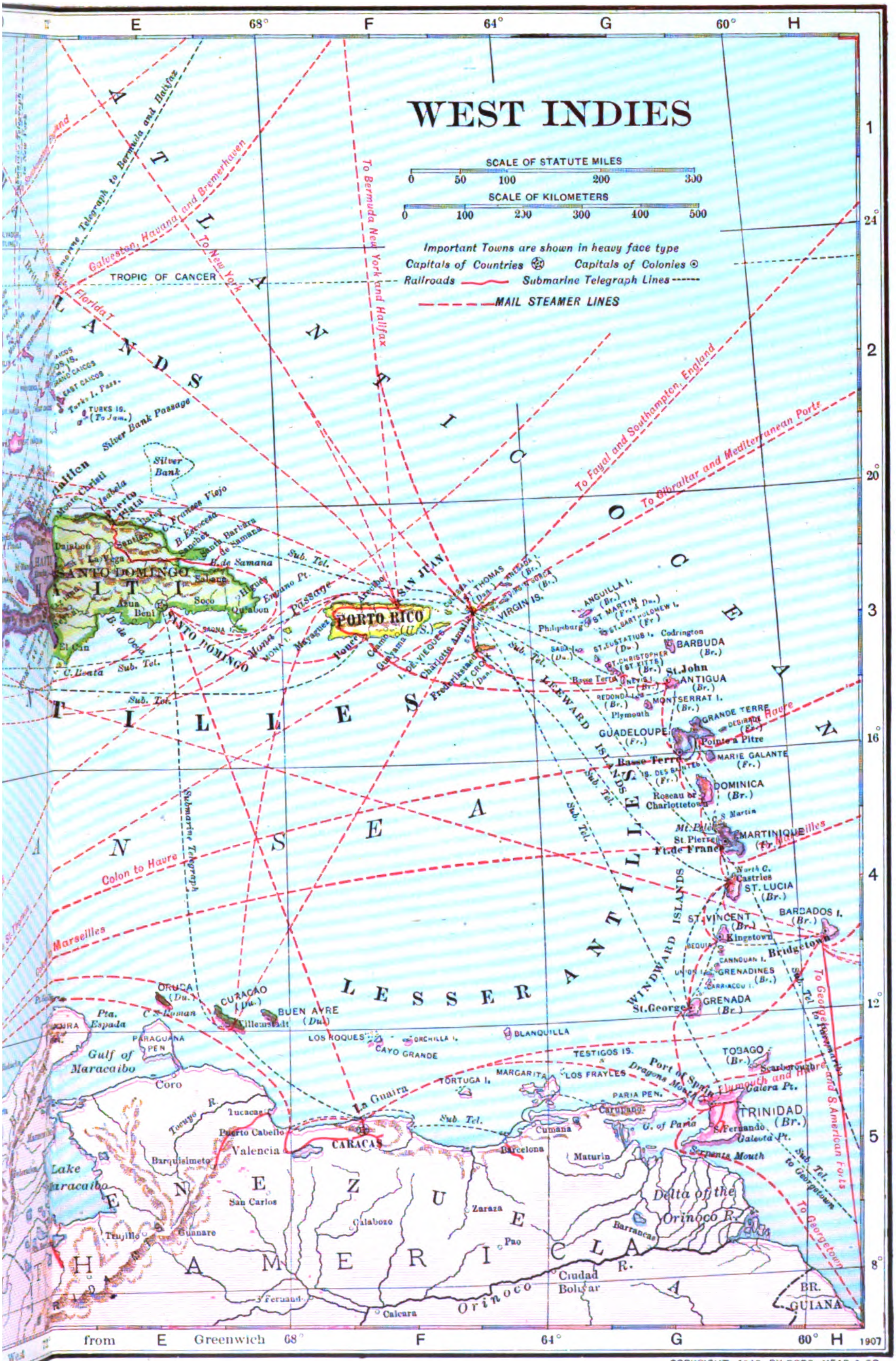

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sugar and pineapples. The capital, St. John, with a population of 9262 and a spacious harbor, is the seat of the Governor-General of the Leeward group. The best port is English Harbor, on the southern coast. The island of Antigua, together with its two dependencies, Barbuda and Redonda, forms one of the five presidencies of the Leeward Islands, and elects four members of the Federal Legislative Council. The commerce of the island is on the decline, owing to the competition of countries paying a bounty on sugar. The value of imports in 1898 was £105,103; 1900, £125,304; 1903, £136,147. Exports 1898, £79,178; 1900, £111,849; 1903, £110,036. The island suffered severely from the hurricane of August, 1899. Antigua was discovered by Columbus in 1493 and settled by the British in 1632. Slavery was abolished on the island in 1834. Consult V. L. Oliver, *History of Antigua* (London, 1894-99).

AN'TI-JAC'OBIN, or **WEEK'LY EXAM'INER,** The. An English paper published from November 20, 1797, to July 9, 1798. It was founded by George Canning and his friends to express their opposition to the principles of the French Revolution. Its editor was William Gifford, who had already made a reputation as a political satirist, among its contributors, besides Canning, being John Hookham, Frere, and George Ellis.

ANTI-JACOBIN REVIEW', The. An English periodical founded by John Gifford in 1798 after the discontinuance of the foregoing, i.e. *Anti-Jacobin, or Weekly Examiner,* with which, however, it had nothing to do. Its full title was *The Anti-Jacobin Review and Magazine, or Monthly Political and Literary Censor.* It ceased to appear in 1821.

AN'TILEGOM'ENA (Gk., spoken against, from ἀντί, *anti*, against + λέγειν, *legein*, to speak). A term applied by Eusebius in his *Ecclesiastical History*, III., 25, to certain New Testament books which were not, in his day, *homologoumena* (ὁμολογούμενα), i.e., everywhere acknowledged as authentic and authoritative. There were seven such books: viz., James, II. Peter, Jude, II. and III. John, Hebrews, and the Revelation of John.

AN'TI-LIB'ANUS, or **AN'TI-LEB'ANON** (Gk. 'Αντιλίβανος, *Antilibanos*, Counter Lebanon). A mountain ridge in Palestine and Syria, about ninety miles long, separated from the Lebanon range on the west by the valley of Cœle-Syria (Map: Turkey in Asia, G 5). It is generally inferior to the Lebanon, its highest peak, Mount Hermon, on the southeast, being only a little over 9000 feet in height. This mountain is covered with perpetual snow, and gives rise to the River Jordan. The Antilibanus is composed of Cretaceous strata, and is almost devoid of cedars. Besides Mount Hermon the highest peaks are Tala-at-Musa (8721 feet), Halimat-Kabu (8257 feet), and Abul-Hin (8330 feet).

ANTILLES, *Engl.* ăn-tĭl'lēz; *Fr.* äɴ'tēl'. A name applied to the West India Islands exclusive of the Bahamas. (See map on following page.) The total area is about 90,000 square miles. The Antilles are generally divided into the Greater and Lesser Antilles. The former comprise the four largest islands, Cuba, Jamaica, Haiti, and Porto Rico. The Lesser Antilles are composed of the Leeward and Windward groups, including all the small islands along the northern coast of Venezuela. Some authorities exclude the Virgin Islands from the Leeward group, thereby making four divisions instead of three. For detailed information, see articles on the groups and separate islands; also article on West Indies.

AN'TILOCA'PRA (*Antilope* + Lat. *capra*, a she-goat). The type genus of the North American ruminant family Antilocapridæ, represented by the pronghorn, characterized by the absence of lateral hoofs, and especially by the fact that the horns, compressed at the base, are branched and deciduous. See Pronghorn.

AN'TILOG'ARITHM. See Logarithm.

ANTI-MACHIAVEL, ăn'tĭ-măk'ĭ-ȧ-vĕl. A treatise written by Frederick the Great before he came to the throne; published by Voltaire in 1740. It is a reply to Machiavelli's *Prince*, and sets forth the obligations of rulers.

ANTIM'ACHUS (Gk. 'Αντίμαχος, *Antimachos*). A Greek poet and critic of Colophon, who lived about 410 B.C. He was a contemporary of Plato and a forerunner of the poets of the Alexandrine School. His works were more remarkable for learning than genius. His chief productions were *Lyde*, a cycle of elegies; an epic poem, *Thebaïs*, which the Alexandrine critics thought worthy to be compared with Homer's *Iliad*, and a recension of the text of the Homeric poems. In the few extant fragments of his works, his style, though learned, is rigid and artificial. Consult: Kinkel's edition of the *Thebaïs*, in the *Epicorum Græcorum Fragmenta* (Volume I., Leipzig, 1877), and Bergk's edition of *Lyde*, in *Poetæ Lyrici Græci* (fourth edition, Leipzig, 1882).

AN'TI-MA'SONS. The name of a political party in New York and other States, organized in 1827-28, chiefly as the result of excitement over the fate of William Morgan, of Batavia, N. Y., who was said to be about to publish, or betray, the secrets of the Masonic order, of which he was a member. He disappeared suddenly in 1826, and his fate has never been satisfactorily determined. The opponents of Freemasonry declared that he had been murdered and his body sunk in the river or lake at Niagara. Legal inquiries followed, but proved nothing. At or about that time the governor of the State was a Mason of the most advanced degrees, and probably a majority of all public officers were members of the order. Widespread excitement pervaded western New York, and the Anti-Masonic party was formed, casting 33,000 votes in 1828, about 70,000 in 1829, and 120,000 in 1830, though many in the latter year were anti-Jackson men, without reference to Masonry. The party attempted to organize on national lines in 1830, and especially in connection with its National Convention of 1831; and in 1832 it supported William Wirt for President, but carried only one State, Vermont. The party was also able, through the disorganization of the Democrats, to control temporarily Pennsylvania, and it was strong in Ohio and Massachusetts; but after 1835 it disappeared as rapidly as it had arisen. Many who were conspicuous later in the two chief parties, such as Thurlow Weed (q.v.) and Seward (q.v.), were members of this party for a brief time; but upon the coalescence of each of the dominant parties, the life of a third national party became an impossibility, especially upon the subsidence of the excitement out of which it had arisen. Consult: Hammond, *Political History of New York State* (Cooperstown, 1846); Alexander, *Political History of the State of New York*, 2 vols. (New York, 1906).

ANTIMONÁN, ăn'tē-mō-năn'. A seaport town of Luzon, Philippine Islands, in the province of Tayabas (Map: Luzon, J 11). It is situated on the eastern coast, opposite the Alabat Island, 19 miles east of Tayabat. Pop., 1903, 11,203.

AN'TIMO'NIAL WINE. See Tartar Emetic.

AN'TI-MONOP'OLY PAR'TY, The. A political party organized at Chicago on May 14, 1884, when it nominated Benjamin F. Butler, of Massachusetts, for the Presidency, on a platform which demanded an Inter-State Commerce law, a direct vote for United States Senators, a graduated income tax, the establishment of labor unions, the repeal of all tariffs, and the prohibition of grants of land to corporations. In the ensuing election, the party united with the Greenback Labor party to form the People's party. See Populist Party.

ANTIMONY (Low Lat. *antimonium*, of disputed origin). One of the well-known metallic elements. It was known to the ancients but first isolated in 1450. It occurs native in small quantities, occasionally with silver, iron, or arsenic. The chief commercial source is stibnite (gray antimony ore), containing 71.77% of antimony and 28.23% of sulphur, which is found in France, Spain, Germany, Italy, Austria, New South Wales, Japan, and in the United States in Arkansas, California, Nevada, Montana. The chief source of antimony in the United States, however, is a by-product obtained in smelting antimonial lead-ores, which yields a 'hard' or antimonial lead containing upward of 25% of antimony. The metal is obtained from the ore in two ways: 1. Roasting the sulphide to form volatile oxide which is collected and subsequently reduced in furnaces or crucibles with carbon under a cover of fusible slag in order to prevent the oxidation of the molten reduced metal. 2. Precipitating molten antimony sulphide in a crucible by metallic iron and salt or sodium sulphate forming metallic antimony and a fusible iron-sodium sulphide; the product after refining contains between 98 and 99% of antimony.

Antimony (symbol Sb., at. wgt. 120.43) is a brittle, hard, silver-white metal, easily crystallized, has a specific gravity of from 6.6 to 6.8, melts between 440° and 450° C., boils between 1090° and 1450° C. The chief commercial use of antimony is as a constituent of alloys (q.v.). With acids antimony forms two classes of salts, —antimonious and antimonic,—in which the element is trivalent and quinquivalent, respectively. The more important compounds of antimony are: the trisulphide, used in medicine and as a brilliant red pigment in oil painting, also in the manufacture of safety matches, percussion caps, and fireworks, and yellow pigments; the pentasulphide, a red pigment used for coloring and vulcanizing rubber, or the trichloride, "butter of antimony," used as a bronzing solution for gunbarrels; the trioxide, used in the preparation of tartar emetic (q.v.), and as a mordant in dyeing vegetable fibre and in printing calico. Of the 4759 short tons produced in the United States in 1904, 2571 tons were contained in antimonial lead; the balance of the output was obtained from imported antimony ores and from antimony 'regulus' (a name applied to partly refined stibnite).

AN'TINO'MIANISM (Gk. *ἀντί, anti*, against + *νόμος, nomos*, law). The doctrine or opinion that Christians are freed from obligation to keep the law of God. It is generally regarded by the advocates of the doctrine of justification by faith as a monstrous abuse and perversion of that doctrine, upon which it usually professes to be based. From several passages of the New Testament, as Romans vi and II. Peter ii : 18, 19, it would seem that a tendency to antinomianism had manifested itself even in the apostolic age; and many of the Gnostic sects were really antinomian, as were probably also some of the heretical sects of the Middle Ages; but the term was first used at the time of the Reformation, when it was applied by Luther to the opinions advocated by John Agricola. Agricola had adopted the principles of the Reformation; but in 1527 he found fault with Melanchthon for recommending the use of the law, and particularly of the Ten Commandments, in order to produce conviction and repentance, which he deemed inconsistent with the Gospel. Ten years after, he maintained, in a disputation at Wittenberg, that as men are justified simply by the Gospel, the law is in no way necessary for justification nor for sanctification. The "Antinomian Controversy" of this time, in which Luther took a very active part, terminated in 1540 in a retractation by Agricola; but views more extreme than his were afterward advocated by some of the English sectaries of the period of the Commonwealth; and, without being formally professed by a distinct sect, antinomianism has been from time to time reproduced with various modifications. It ought, however, to be borne in mind that the term antinomianism has no reference to the conduct, but only to the opinions of men; so that men who practically disregard and violate the known law of God, are not therefore antinomians; and it is certain enough that men really holding opinions more or less antinomian have in many cases been men of moral life. It is also to be observed that the term antinomianism has been applied to opinions differing very much from each other. In its most extreme sense it denotes the rejection of the moral law as no longer binding upon Christians, and a power or privilege is asserted for the saints to do what they please without prejudice to their sanctity, it being maintained that to them nothing is sinful; and this is represented as the perfection of Christian liberty. But besides this extreme antinomianism, than which nothing can be more repugnant to Christianity, there is also sometimes designated by this term the opinion of those who refuse to seek or to see in the Bible any positive laws binding upon Christians, and regard them as left to the guidance of Gospel principles and the constraint of Christian love; an opinion which, whatever may be thought of its tendency, is certainly not to be deemed of the same character with the other. Probably the antinomianism that does not arise out of a dislike of morality usually originates in mistaken notions of Christian liberty, or in confusion of views as to the relation between the moral law and the Jewish law of ceremonial ordinances.

ANTIN'OMY (Gk. *ἀντινομία, antinomia*, opposition of laws; from *ἀντί, anti*, against + *νόμος, nomos*, law). A word used by Kant to mark the "conflict between two propositions, each of which seems to be true, but neither of which has any more claim to our assent than the other." Kant uses the term antithetic in the same sense. Such a conflict arises when our reason "ventures to go beyond the limits of our experience." There are four of these antinomies; the first two being called mathematical, the last two dynamic. In each case the positive assertion is called the thesis, its negation is called the antithesis. Briefly, his theses are: The world (1) is limited in space and time, (2) consists of parts that are simple, (3) admits of causality through freedom, (4) implies the existence of an absolutely necessary being. Over against these stand the antitheses: The world (1) is without limits in space or time, (2) consists of parts always composite, (3) admits of no causality but that of natural law, (4) implies the existence of no absolutely necessary being. Kant overcomes these antinomies by showing that the contradiction is not real if critically considered with due discrimination between noumena and phenomena. See CATEGORY; KANT.

ANTINORI, ăn′tē-nō′rē, MARQUESE ORAZIO (1811-82). An Italian zoölogist and African explorer, born at Perugia. He went to Egypt in 1859, and with Carlo Poggia explored the Upper Nile country. In the *Bulletin* of the Italian Geographical Society, of which he became one of the founders in 1867, he gives an interesting account of his travels through Nubia. He made a tour through Bogoland, north of Abyssinia, after the opening of the Suez Canal, and in 1875 went to Tunis to investigate the practicability of Roudaire's plan for flooding a portion of the Sahara Desert in order to establish communication with the Mediterranean. He headed an important expedition to Shoa in 1876, and gave the first definite information concerning the zoology of that country.

ANTIN′OÜS (Gk. *'Αντίνοος*, *Antinoos*). A beautiful youth of Claudiopolis, in Bithynia. He was page to the Emperor Hadrian, and the object of his extravagant affection, accompanying him in all his travels, but was either drowned accidentally in the river Nile, or, as some suppose, committed suicide from a loathing of the life he led, in 122 A.D. His memory and the grief of the Emperor were perpetuated by many beautiful statues and bas-reliefs, of which several have been found in the villa of Hadrian near Tivoli (Tibur). "In all the figures of Antinoüs," says Winckelmann, "the face has a rather melancholy expression; the eyes are large, with fine outlines; the profile is gently sloped downward; and the mouth and chin are especially beautiful." The city of Besa, in the Thebaïs, near which Antinoüs was drowned, was also rebuilt by Hadrian, and the name of Antinoöpolis conferred upon it, in memory of his favorite. Antinoüs was further enrolled among the gods, and temples erected to him in Egypt and Greece. Antinoüs is a character in two historical romances, *Antinoüs*, by Taylor, translated from the German by Safford (New York, 1882), and *The Emperor* (*Der Kaiser*), by Ebers (Stuttgart, 1880), done into English by Clara Bell.

AN′TIOCH (Gk. *'Αντιόχεια*, *Antiocheia;* Lat. *Antiochea*, or *Antiochia*). The ancient capital of the Hellenistic kings of Syria, on the Orontes, and the most magnificent of the sixteen cities of that name built by Seleucus Nicator, and named for his father, Antiochus. Its situation was admirably chosen. The river Orontes, issuing from the mountains of Lebanon, flows north as far as the thirty-sixth parallel of latitude, and then southwest into the Mediterranean. On the left bank of the river, and at a distance of twenty miles from the sea, lay the famous city, in the midst of a fertile and beautiful plain, ten miles long by five broad. By its harbor, Seleucia, it had communication with all the maritime cities of the West, while it became, on the other hand, an emporium for the merchandise of the East. Behind it lay the vast Syrian desert, across which traveled the caravans from Mesopotamia and Arabia. On the north, the plain of Antioch is bounded by the mountain chain of Amanus, connected with the southeastern extremity of Mount Taurus; and on the south, which is more rocky, by the broken declivities of Mount Casius, from which the ancient town was distant less than two miles. In early times, a part of the city stood upon an island, which has now disappeared. The rest was built partly on the plain, and partly on the rugged ascent toward Mount Casius. The slopes above the city were covered with vineyards, while the banks of the river displayed, as they do even at the present day, a gorgeous profusion of eastern fruit-trees. The ancients called it "Antioch the Beautiful," and the "Crown of the East." It was a favorite residence of the Seleucid princes and of the wealthy Romans, and was famed throughout the world for its luxury. It received from Strabo the name of Tetrapolis, on account of three new sites having been successively built upon, and each surrounded with a wall. Founded by Seleucus Nicator about 300 B.C., it received its first addition from him; its second from Seleucus Callinicus (246-226 B.C.); and its third from Antiochus Epiphanes (175-164 B.C.). Its public edifices were magnificent. The principal were the palace, the senate house, the temple of Jupiter, burnished with gold, the theatre, amphitheatre, and Cæsarium. It had an aqueduct, a public promenade, and innumerable baths. After the founding of Constantinople it ceased to be the first city of the East, but it rose to new dignity as a Christian city, for Antioch was in fact the mother church of Gentile Christianity, the home of the first ministry of Paul, the spot from which he set out on his missionary journeys through Asia Minor and Greece, and the scene of the first conflict between Jewish and Gentile Christianity, the result of which was the Apostolic Council in Jerusalem about 51 A.D. Ten councils were held at Antioch. Churches sprang up, exhibiting a new style of architecture, which soon became prevalent; and even Constantine himself spent a considerable time here, adorning the town and strengthening its harbor, Seleucia.

The Antiochians themselves, however, brought about the ruin of their beautiful city. They were famous, above all other people in ancient times, for their biting and scurrilous wit, and for their ingenuity in devising nicknames. When the Persians, under Chosroës, invaded Syria in 538 A.D., the inhabitants could not refrain from jesting at them. The Persians took ample revenge by the total destruction of the city, which, however, was rebuilt by Justinian. The next important event in its history was its conquest by the Saracens in the seventh century. In the ninth century it was recovered by the Greeks under Nicephorus Phocas, but in 1084 it again fell into the hands of the Mohammedans. The Crusaders besieged and took it in 1098, and it was held by the Christians until 1268. (See Antioch, Principality of.) Since then Antioch has undergone a variety of vicissitudes. Its population at the height of its grandeur is estimated to have been 400,000. Probably no other great city in the world has suffered so frightfully from earthquakes as Antioch. It was destroyed by one in 526 A.D. A destructive visitation occurred in 1872.

The modern town of Antakiyeh, in the vilayet of Aleppo, is situated on the site of the ancient Antioch (Map: Turkey in Asia, G 4). It is poorly built, and presents a striking contrast to the magnificent walls of the old city, which are still partly preserved. It takes up only a small portion of the ancient city, the remainder being covered with olive trees and date palms. The inhabitants carry on some trade in olives, silk, and grain. The population is variously estimated at from 18,000 to 28,000, including only a few Christians.

ANTIOCH, Principality of. A principality founded by the Norman crusader Bohemund (q.v.) in 1099. For about 30 years it was the most important and most wealthy portion of the Christian possessions in Syria. Gradually it declined in political importance; but the city remained a stronghold of Christendom in the East until 1268, when it was captured by Bibars, Sultan of Egypt and Syria. Consult Rey, "Résumé chronologique de l'histoire des princes d'Antioch," in the *Revue de l'Orient Latin*, Volume IV. (Paris, 1896).

ANTIOCH COL'LEGE. An American college, situated at Yellow Springs, O. It opened in 1853, with Horace Mann as its first president. It claims to have been the first college in the world to admit both sexes of all races to equal privileges. It is Christian, but unsectarian. Endowment, 1906, over $100,000; value of buildings and grounds, $150,000; library, 7000 volumes; faculty, 10; attendance, about 100.

AN'TIO'CHIAN SCHOOL. The rival of the Alexandrian School. It held to the grammatical interpretation of Scripture, instead of to the allegorical or mystical. It dates from the martyr Lucian (died 311), and in its later form from Diodones of Tarsus (died 394). Its chief representations are Chrysostom and Theodore of Mopsuestia. In theology, while in the main orthodox according to the Nicene type, it leaned toward asserting rather the conjunction than union of the two natures in Christ.

ANTI'OCHUS (Gk. Ἀντίοχος, *Antiochos*). A common Greek name, borne by thirteen kings of Syria, four kings of Commagene (a small country between the Euphrates and Mount Taurus), and many other persons of note. See the following articles.

ANTIOCHUS I. SO'TER (Gk. Ἀντίοχος Σωτήρ, *Antiochos Sōtēr*, savior, deliverer). King of Syria, 280-261 B.C. The son of Seleucus I. Nicator and Apamea. He was born in 324 B.C., fought at Ipsus in 301 against Antigonus and Demetrius Poliorcetes, was associated with his father as ruler from 293, and became his successor after the murder of Seleucus by Ptolemy Ceraunus in 280. Stratonice, his father's wife, became his own consort, Seleucus giving her to him in view of their mutual affection. She was still living in 268. Whether he subsequently married a sister, daughter of Seleucus and Stratonice, or Stratonice is referred to as his "sister," according to the Egyptian custom, is uncertain. In 275 he gained a decisive victory over the Gauls, who had invaded Asia Minor. But Appian is wrong in maintaining that he was given the surname Soter on this occasion. This seems to have been done only after his death. A cuneiform inscription of the year 269 enumerates all his titles, but does not give this one. At the instigation of Magas of Cyrene, Antiochus declared war against Ptolemy II. Philadelphus. He found an ally in Antigonus Gonatas, King of Macedonia and Greece, but the war led to no decisive issue. He maintained with difficulty the integrity of the great empire his father had left him. Antioch, with its suburb Daphnæ, Seleucia with Ctesiphon, and Sardis were the three capitals of the kingdom. Antiochus was not slain by a Gaul. This frequently occurring statement depends on a confusion with Antiochus Hierax.

ANTIOCHUS II. THE'OS (Gk. θεός, a god). King of Syria, 261-246 B.C. Son of Antiochus I. Soter and Stratonice; succeeded his father. His eight years' war with Ptolemy II. Philadelphus cost him many provinces and cities in Phœnicia and Asia Minor. Only the expulsion of the tyrant Timarchus from Miletus in 250 B.C. can be counted as a real success. He is said to have received the title "Theos" from the grateful Miletians; but this is doubtful. Theodotus seems to have established an independent kingdom in Bactria in 250 B.C., and the Parthian chief Arsaces, or his successor, Arsaces II. Tiridates, took possession of Parthia and made himself practically independent in 248 B.C. Probably as early as 250 B.C. a reconciliation was effected between Antiochus and Ptolemy. The agreement was that the former should divorce his wife, Laodice, and marry the latter's daughter, Berenice. Upon the death of Ptolemy II. in 247 B.C., Antiochus abandoned Berenice and her child, and went to Ephesus, where he took back Laodice and her sons. She, however, seems to have avenged herself by poisoning him in 246 B.C. Laodice then proclaimed her oldest son, Seleucus, king; and her servants by false promises lured Berenice and her son from Daphnæ, where they were strongly intrenched, and slew them both. Laodice's younger son was Antiochus Hierax.

ANTIOCHUS III. THE GREAT. King of Syria, 223-187 B.C. Son of Seleucus II. Callinicus (246-226) and Laodice, a sister of Andromachus, ascended the throne at the age of fifteen, after the murder of his brother, Seleucus III. Ceraunus (226-223). His first expedition was against Ptolemy IV. Philopator (221-204), who had taken possession of Cœle-Syria and Phœnicia. But the revolts of Molon, Governor of Media, and his brother, Alexander, Governor of Persia, forced him to lead an army against them. He succeeded in defeating them, and also in subduing Artabazanes, King of Atropatene, 220 B.C. While he was occupied in these parts, however, Achæus, Governor of Asia Minor, assumed the royal diadem. Antiochus returned to Syria, suffered a severe defeat at the hands of Ptolemy IV. at Raphia, 217 B.C., but still possessed sufficient strength to attack Achæus. After two years' siege, Sardis was captured in 214 B.C., and this dangerous revolt was at an end. Soon after Antiochus marched against Xerxes of Armenia, besieged Arsamosata and received a tribute of 300 talents (212 B.C.). He then continued his march into Susiana and Media (210-209), and took 4000 talents of gold and silver from the temple of Anaïtis in Ecbatana. Arsaces III. Artabanus was defeated, and the Parthian capital Hecatompylus captured. Finally, Arsaces III. sued for peace and promised tribute, 209 B.C. In 208 Antiochus made an attack upon Euthydemos of Bactria, and in 206 this king indicated his willingness to recognize the suzerainty of Syria. He furnished elephants and provisions for the expedition against Sophagasenus of Kophen (Kabul). From here Antiochus returned through Arachosia, Drangiana, Carmania, and Babylonia to Syria in 204 B.C. He now united with Philip of Macedonia against Ptolemy V. Epiphanes. The battle of Paneas, in 198 B.C., in which Antiochus defeated the Egyptian general, Scopas, determined the fate of Palestine. But the Romans were not willing to allow further encroachments. In 196 B.C. they ordered him to return all places taken from Egypt and deprived him of the Thracian Chersonese that had been given to Seleucus by Lysimachus. Against the counsels of Hannibal, who urged him to attack Italy itself, Antiochus went with his army to Greece, where he was defeated at Thermopylæ, 191 B.C. Still more crushing was his defeat at Magnesia in 190 B.C. In the treaty of 188 B.C. he was forced to abandon Asia Minor beyond the Taurus, to pay 15,000 talents, and to give twenty hostages, among them his son. To raise the money he pillaged a temple of Bel in Elymais, and was probably murdered by the outraged people in 187 B.C.

ANTIOCHUS IV. EPIPH'ANES (Gk. 'Επιφανής, *Epiphanēs*, illustrious). King of Syria, 175-164 B.C. Son of Antiochus III., succeeded his brother, Seleucus IV., Philopator (187-175). In 188 he had been sent to Rome as hostage, and he had been educated there; in 176 Seleucus had sent his own son Demetrius to take his place. Antiochus was on his way home, when the news reached him that his brother had been murdered by Heliodorus. He took possession of the throne that by right of succession belonged to Demetrius. Suspicious of the young son of Seleucus, he seems to have used Andronicus to remove him, after which Andronicus himself was executed. In 173 Cleopatra died, and hostilities with Egypt began. His first Egyptian campaign, however, did not occur before 170. He captured Pelusium, entered Egypt, and led Ptolemy VII. Philometor as king into Memphis, sought in vain to storm Alexandria, but defeated Ptolemy IX. Physcon in a naval battle before he was obliged by troubles in Syria to return. In Judæa, Onias III. had been removed from the high-priesthood, and his brother, Jason, who was a mere tool of the ambitious family of the Tobiadæ, put into his place in 173. Immediately before the Egyptian expedition, the Tobiad Menelaüs secured from Antiochus the high-priestly office. When a rumor spread in Jerusalem that Antiochus had perished, Jason returned, but his brother, Onias III., was preferred by the people. Jason fell and Onias was made high-priest. Menelaüs and other Tobiadæ fled to Antioch. On his way back, Antiochus went to Jerusalem to reinstate Menelaüs. Onias III.. fled to Egypt, where he was granted the privilege of building a temple at Leontopolis by Ptolemy VII. Philometor. Antiochus entered the temple in Jerusalem and took many of its treasures, among them the golden altar, the candelabra, and the table of incense. He does not seem to have shed any blood. In 168 he undertook his second campaign against Egypt, where Philometor and Physcon were now united against him. His progress was checked by the Roman legate, Popilius Lænas, who demanded immediate obedience to the demands of the Senate. Returning to Syria, he found many of the Jews embittered by the indignities heaped upon them, rebellious against the illegitimate high-priest, and scarcely concealing their joy over his humiliation. He, therefore, ordered the walls to be razed, fortified the Acra, put in a strong garrison, destroyed in part the temple, erected on the top of the old altar a new one to Zeus Olympius (*Shikkuz Shamen*, "abomination of desolation;" for *Baal Shamem*, "lord of heaven," Dan. xi : 31), abolished the sacred seasons, forbade circumcision, and burned sacred books, 168 B.C. This course of action may, in part, have been due to a genuine zeal for the god of Hellas, for whom he must have longed during his Roman days, and on whose sanctuaries at Athens, Olympia, and elsewhere he later lavished his gifts. On the other hand, reasons of state may have led him to build a temple to Jupiter Capitolinus in Antioch. That he should have forsaken the gods of his fathers to worship this strange "god of fortresses," seemed to the author of Daniel a particular sign of his wickedness (xi : 38). His stringent measures for the Hellenization of Judæa caused the Maccabæan revolt. Mattathias began the rebellion. After his death in 166, his son, Judas, defeated Apoleonius, Seron, Gorgias, and finally Lysias himself; took possession of Jerusalem, except the Acra, and restored and rededicated the temple in December, 165 B.C. Meanwhile Antiochus had gone with an army, first against Armenia and Sophene, 166 B.C., then against Messene on the Persian Gulf, 165 B.C., and finally into Susiana, gaining many victories everywhere. He attempted to plunder the temple of Nanæa in Elymais, but the people defended successfully their sanctuary, and he was forced to retire to Babylon. In Persis he received the sad news from Judæa, and died in Tabæ, 164 B.C.

ANTIOCHUS V. EU'PATOR (Gk. Εὐπάτωρ, *Eupatōr*, born of a noble father). King of Syria, 164-162 B.C., son of Antiochus IV. He was only nine years old when his father died. Lysias became his guardian and regent of the Empire. Accompanied by the young king, Lysias marched against Judæa to quell the Maccabæan revolt. At Beth Zechariah Judas was defeated, Bethzur was taken, and the temple mountain was besieged. The Jews were obliged to negotiate for peace. They had to recognize the Seleucid authority, raze the fortifications of the temple, and accept the garrison in the Acra; but on the other hand were allowed religious freedom. Lysias was quite able to cope with Philip; but both he and his royal ward succumbed to Demetrius, son of Seleucus IV., in 162 B.C.

ANTIOCHUS VI. THE'OS (Gk. Θεός, god). King of Syria, 145-142 B.C. Son of Alexander Balas and Cleopatra, was proclaimed king while still a minor, living at the court of Imalcue, or Yamliku, King of Chalcis, by Diodotus, called Tryphon, one of Alexander's generals. Tryphon was supported by Jonathan in his struggle against Demetrius, but became apprehensive of the growing power of the Jewish high-priest and ordered him to be executed in Baskama, 143 B.C. In 142, Antiochus, who had been only a tool, was removed, and Tryphon ascended the throne.

ANTIOCHUS VII. SIDE'TES (Gk. Σιδήτης, *Sidētēs*, native of Side). King of Syria, 137-128 B.C. Son of Demetrius I., born at Side in Pamphylia. He resided in Rhodes when he learned that Demetrius II. Nicator had beeen taken prisoner by the Parthians. He went to Antioch, and was recognized as king. One of his first acts was to write to Simon, the Jewish high-priest, confirming him in his position and granting him the right of coining money. Having overthrown Diodotus, however, he demanded of Simon Joppa, Gazara, and the citadel of Jerusalem. This Simon refused to give, and when Antiochus sent his general, Cendebæus, against him, Simon's sons, Judas and John Hyrcanus, gained a victory, 137 B.C. In 134 B.C. Antiochus marched against Jerusalem, having devastated Judæa, captured the city after a long siege, and imposed very severe conditions upon the country. John Hyrcanus was forced to pay a tribute of 500 talents, to give hostages, and to send troops for the Parthian war. Having restored order in Syria, Antiochus attacked Phraates 130 B.C., defeated him in three battles, and secured the freedom of his brother. But his demands were so exorbitant that the negotiations led to no treaty of peace, and a reversal of fortunes caused Antiochus to lose all that he had gained. Not to fall into the hands of his enemies, he hurled himself from a rock, 128 B.C.

ANTIOCHUS VIII. GRY'PUS (Gk. γρυπός, *grypos*, hook-nosed). King of Syria, 125-113 and 111-96 B.C. Son of Demetrius II. Nicator and Cleopatra; succeeded his father in 125. He continued the struggle that Demetrius had had with Alexander, called Zabina, "the purchased one," and finally vanquished him in 121. Cleopatra, who found him too independent, wished to get rid of him, but he forced her to drink the poisoned cup she had prepared for him. For eight years he reigned peacefully, until in 113 Antiochus IX. Cyzicenus aroused his suspicions. This son of Sidetes had just married Cleopatra, daughter of Ptolemy IX. Physcon. With the aid of the Egyptian king he raised an army and captured Antioch. Antiochus Grypus recaptured the city, and his wife, Tryphæna, put her sister Cleopatra to death in a cruel manner. Soon after Cyzicenus defeated Grypus and avenged his wife on Tryphæna. A reconciliation was effected between the two brothers in 111, and they continued to reign over different parts of northern Syria. Antiochus VIII. was slain by Heracleon in 96 B.C.

ANTIOCHUS IX. CYZ'ICE'NUS (Gk. Κυζικηνός, *Kyzikēnos*, native of Cyzicus). King of Syria, 113-95 B.C. Son of Antiochus VII. Sidetes and Cleopatra, was sole ruler of Syria between 113 and 111, and from that time to his death held a part of Syria, adjoining Palestine. He aided the Samaritans against John Hyrcanus (110-107 B.C.) without success, and a second attempt to subdue Judæa with the aid of Ptolemy XI. Lathyrus likewise failed. Having been defeated in a decisive battle with Seleucus VI., he took his own life in 95 B.C.

ANTIOCHUS X. EU'SEBES (Gk. Εὐσεβής, *Eusebēs*, pious). King of Syria, 95-92 B.C. Son of Antiochus IX. Cyzicenus. He continued the war against Seleucus VI. and forced him to retire to Mopsuestia, where he was murdered by the populace in 95 B.C. He also defeated Antiochus XI. and Philip in 93 B.C., but was himself vanquished by Philip and Demetrius III. in 92 B.C. and obliged to flee to the Parthians. He is supposed to have died in 75 B.C., leaving two sons, Antiochus XIII. and Seleucus Cybiosactes. His widow, Selene, was given a few towns in Syria by Tigranes of Armenia, who in 92 B.C. took possession of Antioch.

ANTIOCHUS XI. EPIPH'ANES (Gk. Ἐπιφανής, *Epiphanēs*, illustrious). King of Syria, 95-93 B.C., son of Antiochus VIII. Grypus; upon the death of Seleucus VI., in 95 B.C., he assumed the royal diadem; together with his brother Philip he took vengeance upon the people of Mopsuestia, who had murdered Seleucus VI. But on his return to Syria he was defeated by Antiochus X., and was drowned in the Orontes in 93 B.C.

ANTIOCHUS XII. DIONY'SUS (Gk. Διόνυσος, *Dionysos*, Bacchus). King of Syria, 85 B.C., son of Antiochus VIII. He took the crown when he learned that his brother Demetrius III. had been made a prisoner by the Parthians, and intrenched himself in Demetrius's capital, Damascus. He was at first victorious in his campaign against the Nabatæans, but was defeated in a second battle, and lost his life in 85 B.C.

ANTIOCHUS XIII. A'SIAT'ICUS (Gk. Ἀσιατικός, *Asiatikos*, Asiatic.) King of Syria, 69-64 B.C., son of Antiochus X. He was sent by his mother, Selene, to Rome, together with his brother Seleucus Cybiosactes, in 74 B.C., to present his claims to the throne of Egypt, but returned to Syria in 71, having been kept for a ransom by Verres in Sicily, as Cicero informs us. After his victory over Tigranes, in 69 B.C., Lucullus gave to Antiochus a large part of Syria, which he retained until Pompey made it a Roman province, in 64 B.C.

ANTIOCHUS HI'ERAX (Gk. Ἱέραξ, *hierax*, hawk). Son of Antiochus II. and Laodice. He was made King of Cilicia by Ptolemy III. Euergetes in 243 B.C. Ostensibly for the purpose of assisting Seleucus II. Callinicus (246-226) to recover certain provinces that the Egyptian king had taken from him, but really to deprive him of all that he had left, Antiochus sent an army to Syria. Ptolemy came to an agreement with Seleucus, but the war between the two brothers continued. With the aid of the Gauls, Antiochus won a decided victory near Ancyra in 242. Seleucus was supposed to have been slain, and Antiochus mourned him. He then turned his arms against Demetrius of Macedonia, and subsequently against Attalus of Pergamus. The war with Seleucus was renewed, and Eumenes used the opportunity to take possession of a large part of Asia Minor. After a signal defeat at the hands of Seleucus, Antiochus fled first to Cappadocia and then to Armenia. Suspecting foul play, he left for Egypt. Ptolemy III. made him a prisoner. He escaped, however, and ended his stormy career at the hands of brigands in Thrace, 225 B.C.

ANTIOCHUS OF AS'KALON (?-c. 68 B.C.). A Greek philosopher. He succeeded Philo as head of the celebrated Academy near Athens. Abandoning the more recent traditions of the Skeptic system, he introduced into the Academy the philosophy of Stoicism, the fundamental tenets of which he believed to have originated in the Old Academy of Plato.

ANTIOPE, ăn-tī′ō-pē. See AMPHION.

ANTIOQUIA, ăn′tē-ō′kē-ä. A department of Colombia, South America, bounded by the department of Bolivar on the north, Santander on the east, Tolima on the south, and Cauca on the west. Its area is 26,612 square miles. Situated in the region of the Cordilleras, Antioquia has a very mountainous surface. The mineral wealth of the department is considerable, and the chief occupation is mining. The population is about 570,000. Capital, Medellin.

AN′TIPÆ′DOBAP′TISTS. Those who oppose infant baptism. See BAPTISM, INFANT.

AN′TIPAR′ALLELS (*anti* + *parallel*). If a pencil of two lines, $O — XY$, is cut by two parallel lines, AB, MN, and if MN revolves through a straight angle about the bisector of $< XOY$ as an axis falling in the position A_1B_1, then AB and A_1B_1 are said to be antiparallel to each other. OA and OA_1 are called corresponding segments of the pencil, as are also OB and OB_1. A and A_1 are called corresponding points, as are also B and B_1. The concept of antiparallels materially simplifies the treatment of a number of propositions of elementary geometry; e.g., in the above figure it is easily seen that $OA:OM = OB\cdot ON$, whence $OA\cdot OB_1 = OB\cdot OA_1$. In the following figures, since AB and A_1B_1 are antiparallels, we have at once the proof of the important proposition that wherever the point O be taken $OA\cdot OB = OB\cdot OA_1$.

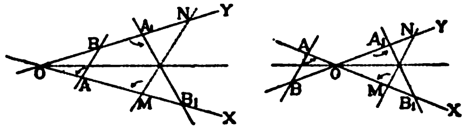

FIG. 1.

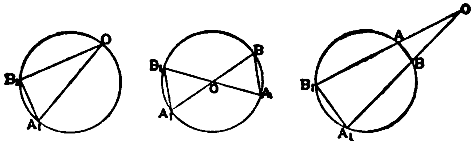

FIG. 2.

ANTIP′AROS (Gk. 'Αντίπαρος, opposite Paros). Anciently called Olearos or Oliaros. One of the Cyclades Islands, celebrated for a stalactitic cave. It is separated from Paros by a narrow strait. It contains, 1896, 596 inhabitants, and forms a part of the eparchy of Naxos. Antiparos is seven miles long by about three wide; it is scantily supplied with water, but the flats in the north and west are tolerably fertile. Corn and wine are cultivated, and there is pasturage for large flocks of goats. The principal occupation of the inhabitants is fishing. From Kastron, the only village on the island, the distance to the grotto is about an hour and a half's ride. This wonderful cave is not mentioned by any Greek or Roman writer whose works are extant, but must have been visited by the curiosity-hunters of antiquity, for the names of ancient tourists are inscribed about the entrance. It may well have been a place of worship. The entrance is near the top of a mountain on the southern coast. From a small chamber a long and somewhat dangerous descent leads to the great cavern, 80 feet high, more than 300 feet long, and 100 feet broad, which contains remarkable specimens of stalactitic formation. The cave was first made known to the modern world by M. de Nointel, French ambassador to the Porte, who, in 1673, spent three days in it and caused the Christmas mass to be celebrated on a natural altar. Views of the entrance and exterior are published in the *Bulletin de géographie historique et descriptive* (Paris, 1887-97). Excavations by Messrs. Bent and Tsountas have brought to light a number of graves belonging to an early period in the "Island" civilization. Since 1872, profitable lead mines have been worked on the island. Consult Bent, *The Cyclades* (London, 1885).

AN′TIPAS. See HEROD.

ANTIP′ATER (Gk. 'Αντίπατρος, *Antipatros*). (c. 400-319 B.C.). (1) The son of Iollas, and one of the most distinguished generals of Philip of Macedon and Alexander the Great. It was especially through the loyal services of Antipater and Parmenion that Alexander was enabled to establish his kingdom on a firm basis. When Alexander led his troops into Asia, he left Antipater in sole charge of affairs in Macedonia. The latter discharged the duties of his office with great ability, suppressing insurrections in Thrace and Sparta and supporting Alexander with fresh troops from home. But he was on the point of being superseded by Craterus, through the influence of Olympias, the mother of Alexander, when Alexander died. The government of Macedonia was assigned to Antipater anew, and he was soon after called upon to defend himself against an alliance of the Grecian States. He at first met with reverses, but with the assistance of Craterus, who was also his son-in-law, and Leonnatus, he finally brought the allies into subjection in 322 B.C. This war is usually called the Lamian War, from Lamia, where Antipater was besieged in 323 B.C. Everywhere oligarchies were established, and Athens was obliged to deliver up Demosthenes and Hyperides and receive a garrison in Munychia. This war was followed by another with Perdiccas, Antipater's son-in-law, and Antipater was again successful. After the murder of Perdiccas, in 321 B.C., Antipater was appointed to the supreme regency of Macedonia and the guardianship of Alexander's children. He made a new division of the kingdom, but died shortly after, in 318 B.C., leaving the regency to Polysperchon and a subordinate position only to his own son, Cassander.

(2) Son of Cassander and King of Macedonia. His reign followed that of his brother Philip, who had followed Cassander in 297 B.C. He was killed, 287 B.C., by order of Demetrius Poliorcetes. (3) Father of Herod the Great. His first appearance is in the reign of Aristobulus II. (69-63 B.C.), as a man of great wealth and important connections. He supported Hyrcanus II. against the power of Aristobulus, and after Hyrcanus, in 63 B.C., opened the gates of Jerusalem to Pompey, the influence of Antipater grew apace. In 47 B.C. he was appointed procurator of Judæa. In the struggle between Pompey and Cæsar he supported the former; but after the defeat of Pompey, made his peace with Cæsar, and continued thereafter his firm adherent. Cæsar showed him many marks of favor. Antipater

was poisoned in 43 B.C. (4) Son of Herod the Great by his first wife, Doris; a worthless prince, who was perpetually conspiring against the life of his brothers. He was finally tried before Quintilius Varus, and executed in prison five days before Herod died.

ANTIP'ATHY (Gk. ἀντί, *anti*, against + πάθος, *pathos*, suffering, affection, emotion, feeling). By derivation, the opposite of *sympathy* (q.v.). It may be defined as a permanent aversion to, or settled incompatibility with, some object or some quality of an object. We may distinguish between formal or logical antipathy and concrete or actual antipathies. The choleric temperament is, formally, antipathetic to the phlegmatic, and the sanguine to the melancholy. (See TEMPERAMENT.) The term is, however, more usually restricted to such definite cases of individual aversion as the dislike shown by many persons to certain animals—snakes, mice, toads, cats. Some of these antipathies, doubtless, have their root in a cultivated affectation, or in the unconsidered encouragement of a prejudice imbibed in childhood; others date from a particular occasion of fright, or are due to the chance association of the object with an unpleasant incident. If, e.g., a house swarms with mice during a period of great mourning, it is probable that the mourners will henceforth show a marked antipathy to these animals. But there are cases which require a different principle of explanation. The aversion to snakes, e.g., which often prevails among those who have never come into contact with the reptiles, and who have nothing to fear from those that they may happen to meet, is, perhaps, a phylogenetic symptom. The snake is the chief enemy of the monkeys, as readers of Kipling's *Jungle Book* will remember; and the liability to fear of snakes may be a heritage from our pre-human ancestry. Some persons, again, cannot enter a room which contains a cat. The explanation may be that the valerianic odor peculiar to the animal is automatically associated in certain constitutions to organic sensations of nausea or shuddering, just as there are persons who are subject to shivering and gooseflesh when a slate pencil squeaks upon a slate. At any rate, the mammals that excite antipathy (mouse, cat, fox, hare, pig) have one and all a marked and peculiar scent; and we know from animal psychology that a smell-stimulus may set up a well-marked chemo-reflex. The aversion to mice may be derived in part from the uncanny and snake-like character of their locomotion, and in part from the ubiquity which their small size makes possible. The aversion to toads (apart from superstitious belief in their poisonous properties) may be due to the clammy cold of their skin; we all know the horrible feeling that arises if, being in the pantry in the dark, we lay our hand by chance upon a piece of cold potato. Many historical cases of antipathy cannot now be explained, simply because we have only the record of the bare fact, with no mention of the conditions under which the antipathy took shape.

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ANTIP'ATRIS. A city of Palestine, built by Herod the Great (37-34 B.C.) in honor of his father, Antipater. It was situated in the Plain of Sharon, about 11 miles east-northeast of Joppa. In Roman times it was of importance as the junction of several military roads leading from the south and east to Cæsarea, the Roman capital of Palestine. By the Jews it was considered the northwest limit of strictly Jewish territory. Josephus often mentions it. Paul was escorted as far as Antipatris by Roman soldiers when he was taken from Jerusalem to Cæsarea (Acts xxiii: 31-32).

ANTIPH'ANES (Gk. 'Αντιφάνης). A Greek comic poet of the fourth century B.C. He was one of the chief representatives of the Middle Comedy. Many fragments of his works—which numbered, according to some estimates, 365, and to others 260—are preserved. He is praised by Athenæus for his polished diction. Consult Meineke, *Poetarum Comicorum Græcorum Fragmenta*, Volume III. (Berlin, 1839-57).

ANTIPH'ILUS (Gk. 'Αντίφιλος, *Antiphilos*). A Greek painter of Egyptian birth, who lived at the court of the first Ptolemy, about 330 B.C. Quintilian, who classes him among the greatest painters of the age of Philip and Alexander, says he excelled in the graceful treatment of subjects of high art, as well as of daily life.

ANTIPHLOGISTIC. An agent supposed to combat or prevent inflammation, such as bloodletting, or the internal administration of aconite, veratrum, gelsemium, etc. A favorite local application consists of fuller's-earth and glycerine.

AN'TIPHON (Gk. ἀντίφωνα). A notable part of the breviary offices in all Western uses. The recitation of the Psalter forming the staple of the office, antiphons or short texts (generally from Holy Scripture), having special reference to the feast or season celebrated, were sung in connection with the psalms and evangelical canticles to give color and appropriateness to the invariable parts of the service. On the greater festivals (hence called "double feasts"), the antiphons are sung entire before and after the psalms: at other times only the first two or three words were sung before and the entire antiphon after. Pope Gregory I. in 590 prepared the first regular *antiphonarium*, a service book containing the proper music for the antiphons.

ANTIPHON (Gk. 'Αντιφῶν) (480-411 B.C.). The earliest of the Ten Attic Orators in the Alexandrian Canon. He was the son of Sophilus the Sophist, and was born at Rhamnus, in Attica. Although Antiphon was undoubtedly influenced by the teachings of Gorgias, he never developed so rhetorical a style as some of the later orators. He labored to make his arguments clear, solid, and convincing, so that it might be impossible for the judges who listened to the speeches he wrote to refuse their assent to his propositions. His success was unmistakable. Although he never made a public appearance as a pleader in the courts of justice, but contented himself with writing speeches for others to deliver, he acquired great influence, which he did not fail to exert for the furtherance of his political principles. To him must be attributed the overthrow of the Athenian democracy (411 B.C.) and the establishment of the oligarchical government of the Four Hundred; for although Pisander figured prominently before the people in this revolution, the whole affair, according to Thucydides, was secretly planned by Antiphon. The oligarchical government fell within the year, and Antiphon was brought to trial for treason for having attempted to negotiate peace with Sparta. Thucydides affirms that an abler defense was never made by any man in a similar position. He was condemned to death, his property was confiscated, his house razed to the ground, his remains forbidden interment in Attica, and his children forever declared incapable of enjoying civic privileges. Of the sixty orations which the ancients possessed, only fifteen have come down to us. Three of these are written for others, and are admired for their clearness, purity, and vigor of expression; the remaining twelve appear to have been intended as specimens of school rhetoric for his pupils. Edited by Blass (Leipzig, 1881). Consult also: Blass, *Attische Beredsamkeit* (Leipzig, 1887-98); and Jebb, *Attic Orators* (London, 1876-80).

ANTIPHON (Gk. Ἀντιφῶν, *Antiphōn*) and **BRY'SON.** Greek mathematicians of the fifth century B.C., who are credited with having introduced the process of exhaustion for the purposes of the quadrature problem. See QUADRATURE.

ANTIPH'ONY (Gk. ἀντί, *anti*, against + φωνή, *phōnē*, sound, voice). A name given by the ancient Greeks to a species of musical accompaniment in the octave, by instruments or voices, in opposition to that executed in unison, which they called *homophony*. Antiphony is also the name of a species of sacred song sung by two parties, each responding to the other, a practice which was cultivated in the early ages by the Hebrews, Greeks, and Romans. Many of the psalms of David show that antiphonal singing was then in use. Its introduction into the Greek Church is ascribed either to Ignatius, Bishop of Antioch, in the second century, or to St. Chrysostom, about 400 A.D.; and Ambrosius, Bishop of Milan, is said to have introduced it into the Western Church in the fourth century. The dividing of the antiphonies into verses, with rules regarding the same, is attributed to Pope Celestine in 432. The reformed Christian churches of Germany and England have still retained a certain degree of antiphonal singing, and there are several antiphonal choirs in America, notably that in the church of the Paulist Fathers in New York. The chanting of the psalms in the English cathedral service is an imitation of the ancient antiphony.

ANTIPH'RASIS (Gk. ἀντίφρασις, from ἀντί, *anti*, against, contrary + φράζειν, *phrazein*, to point out, declare, tell). A technical term used by the ancient rhetoricians and grammarians signifying, etymologically, "contrary-speaking." Properly, it denoted the process of expressing an idea, generally an unpleasant idea, by using a word or expression of opposite meaning to the natural one. Thus, the Furies were called the *Eumenides* (the kindly minded ones), and the Black Sea, though inhospitable (ἄξεινος, *axeinos*), was named *Pontos Euxeinos* (the Hospitable Sea). The word antiphrasis was used also in a broader sense of the process of expressing one idea by negativing the opposite; e.g., *not unmindful*, meaning emphatically *mindful*. This figure is, however, called distinctively Litotes.

ANTIPODES, ăn-tĭp'ō-dēz (Gk. plur. ἀντίποδες, from ἀντί, *anti*, against + πούς, *pous*, foot). Literally, those who have their feet over against each other. As applied to geography, the term means the inhabitants of any two opposite points of the globe, or, in other words, the dwellers at the opposite extremities of any diameter of the earth. From this primary relation there necessarily arise many secondary relations. Antipodes must be on one and the same meridian of longitude, separated from each other by half the circumference. Being so situated on one and in the same meridional circle, they must differ in longitude exactly 180°, with the exception of the poles themselves, which have an indeterminate longitude; and being separated from each other by half the circumference, they must be equi-distant from the equator in opposite directions. Take Edinburgh as an example, in lat. 55° 57′ N. and long. 3° 11′ W., its antipodes must be in lat. 55° 57′ S. and in long. 176° 49′ E., which is merely an undistinguishable spot in the Antarctic or Southern Ocean. Take as another example London, in lat. 51° 30′ N. and long. 0° 5′ W. Its antipodes must be in lat. 51° 30′ S. and in long. 179° 55′ E., coinciding pretty nearly with a small island to the southeast of New Zealand. This small island, in honor rather of London than of itself, has appropriated the peculiar name Antipodes Island.

Between antipodes in general there necessarily exist also other secondary relations. With reference to the earth's daily rotation, noon of the one side must be midnight of the other; while with regard to its annual revolution, summer and autumn of the one side must be winter and spring of the other. With respect, however, to the former contrast, some explanation may be required. If this, for instance, is Wednesday in London, was last midnight in that city the noon of Tuesday or of Wednesday at Antipodes Island? The answer to this question depends upon a conventional usage, according to which (with a few exceptions, dictated by practical considerations) the time of all places east of Greenwich is said to be later than that at Greenwich, and the time of all places west of Greenwich is said to be earlier than that at Greenwich. To avoid confusion it has been agreed, further, to think of Antipodes Island as situated *east* of Greenwich. With this in view, it is clear that the midnight in question at London corresponded to Wednesday noon at Antipodes Island. See INTERNATIONAL DATE-LINE.

ANTIPODES IS'LAND. A small island southeast of New Zealand, in 49° 42′ S. lat. and 178° 43′ E. long., so called because it is nearly the antipode of London (Map: World, Western Hemisphere, O 3). It is uninhabited, and has an area of only about 20 square miles. See ANTIPODES.

AN'TIPOPE. A pontiff elected in opposition to one canonically chosen. The regular Popes of Rome were occasionally out of favor with a faction which chose its own bishop (e.g., Hippolytus, 218-223; Felix II., 355-356), but the first Antipope is reputed to be Laurentius, elected in 498, in opposition to Symmachus. Several emperors of Germany set up Popes against those whom the Romans had elected without consulting them. Otho the Great displaced successively two Popes of Rome; and when the Antipope Sylvester III. had expelled Pope Benedict IX., Conrad II., Emperor of Germany, brought back this ecclesiastic, who transferred his dignity to Gregory VI. (1044). There were now, consequently, three Popes, and their number was increased to four by the election of Clement

II. in 1046. Shortly after, Alexander II. found a rival in Honorius II. (1061), and in 1080 the same unseemly spectacle was witnessed when Henry IV., Emperor of Germany, elevated to the papal chair Guibert of Ravenna, under the title of Clement III., in opposition to his implacable adversary, Gregory VII. But after the death of Gregory, Clement was himself opposed successively by Victor III. and Urban II., and at last died at a distance from Rome, having just beheld the exaltation of Pascal II. as the successor of Urban. During the twelfth century several Antipopes flourished, such as Gregory VIII. and Honorius III. On the death of the latter, France began to intermeddle in these disgraceful strifes, and upheld the cause of Innocent II. against Anacletus, while the kings of Sicily, on the other hand, more than once set up a pontiff of their own against the choice of the emperors. Between 1159 and 1378 there were four Antipopes; but the most remarkable epoch is "the great schism of the West" produced by these unedifying rivalries in 1378—a schism which divided the Church for fifty years. It broke out after the death of Gregory XI. at the election of Urban VI., whom the voice of the Roman people, demanding an Italian Pope and not one who should fix his pontificate, like several of his predecessors, at a distance from Rome, had elevated to the papal throne. The French cardinals objected, withdrew to Provence and elected a new Pope, under the name of Clement VII., who was recognized by France, Spain, Savoy, and Scotland, while Italy, Germany, England, and the whole north of Europe supported Urban VI. These two Popes excommunicated each other; nor did they even fear to compromise their sacred character by their strife. The schism continued after their death, when three Popes were elected by different parties, all of whom were deposed by the Council of Constance, in 1415, and Cardinal Colonna elected in their place, under the title of Martin V. The last Antipope was Felix V. (1439-49). These divisions are often alleged as an argument against the doctrine of papal infallibility; but Catholics consistently affirm that the privilege of infallibility is only claimed in matters of doctrine, and has no relation to questions of fact, such as disputed succession or canonicity of election.

AN'TIPYRET'IC (Gk. ἀντί, *anti*, against + πυρετός, *pyretos*, burning heat, fever). Any drug which lowers febrile temperature by action upon the blood, the circulation, or the secretion of sweat, or by changes in heat production and dissipation through the nervous system. The most important are antipyrine, acetanilide, phenacetine, quinine, salicylic acid (qq.v.) and its derivatives, and others of the benzene series. Less importance than formerly is attached to the action of such drugs in diminishing temperature, as fever is now regarded as a symptom of some disturbance, a symptom which is in many cases best relieved by removing its cause. If the temperature is so high as to appear to be injurious in itself, or if it causes discomfort, these remedies may be of value. Many of them are efficacious also in relieving pain; e.g., salicylic acid in acute rheumatism; antipyrine, antifebrine, or phenacetine in any painful febrile condition. Quinine is used in malarial fever, not for its antipyretic effect, but to overcome the malarial organism. (See MALARIA.) Cold baths, sponges, packs, etc., are frequently employed to reduce temperature. The antipyretic action of drugs is usually accompanied by more or less depression of the heart. See CINCHONA; SALICYLIC ACID.

AN'TIPY'RINE (derivation same as of *antipyretics*). An artificial alkaloid, having the composition $C_{11}H_{12}N_2O$. It is a white, crystalline powder, freely soluble in water and alcohol, and having a slightly bitter taste. It diminishes the force and frequency of the heart's action and lowers the arterial tension; reduces the frequency of respiration and the amount of carbonic acid given off, and diminishes the amount of urine, of urea, and of uric acid. The temperature of the body is diminished, partly on account of perspiration, but also from increased radiation of heat on account of dilatation of the superficial blood vessels, and perhaps also from lessened heat production. Antipyrine tends to allay nervous irritability and to relieve pain. It sometimes forms met-hæmoglobulin in the blood.

1. *As an antipyretic*, it is prompt, and, as a rule, very efficient. The fall of temperature begins in half an hour, usually reaches its lowest point in from two to five hours, and lasts from five to eight hours. The fall is usually through several degrees, and sometimes below normal. It is generally accompanied by sweating, and occasionally by signs of heart failure.

2. *As an analgesic*, it is prompt and efficacious. It has proved of great value in all varieties of neuralgia, both superficial and visceral; in all forms of headache, and in dysmenorrhœa. It is, of course, more serviceable when these conditions are of functional origin and not organic.

3. *As an antiperiodic*, it is of no value.

4. *For rheumatism*, it is frequently very useful, resembling in its action salicylic acid. It lessens the severity of an attack by relieving pain and reducing temperature, but seems to have no influence in diminishing the liability to heart complications, and is probably not curative.

5. *As a nervous sedative*, it is of some value in epilepsy, but of doubtful utility in chorea. In whooping cough it often abates the frequency and severity of the paroxysms, but does not seem to shorten the course of the disease.

6. *As an hypnotic*, it seems to be of some use, inducing sleep by removing the pain or fever which prevents it.

7. *As a hæmostatic*, it is efficient locally in powder or solution.

8. *For the morphine habit*, it is used as a substitute for morphine, by mouth or hypodermically, but is of doubtful value.

Antipyrine frequently produces untoward symptoms. These may be grouped under: (1.) *Circulatory*. Cyanosis, frequent and feeble heart action, dyspnœa, sometimes collapse, occur not uncommonly. Serious symptoms have been produced by ten or fifteen grains, and even death has been caused. This must be remembered especially in cases where the natural tendency of the disease is toward heart weakness. In these cases it is very advisable to give some stimulant with the antipyrine. If it has to be given frequently, great care must be used, as a cumulative action has been noticed in several cases. The dose which is at first safe may become poisonous if repeated several times in a day. Individual susceptibility varies greatly. (2.) *Cutaneous*. Among the rashes noticed are some which resemble measles, scarlatina, urticaria, erythema, and purpura. These are unpleasant, but not serious. (3.) *Nervous*. These include various paræsthesiæ, vesical spasms and cramps, but are usually not serious.

It may be given by mouth in powder, or dissolved in water or an alcoholic beverage. The dose depends upon individual susceptibility. It is also administered hypodermatically. See Acetanilid; Phenacetin.

AN'TIQUA'RIAN SOCI'ETIES. Organizations in Europe, England, and America for the promotion of the study of antiquities. The London Society of Antiquaries was antedated by a society established in 1572, and dissolved by James I. about 1604. The present London society began to meet about 1707, and received its charter in 1751. The Scottish Society of Antiquaries was founded in 1780, the French society in 1814, and the American Antiquarian Society (see Antiquarian Society, American) in 1812.

ANTIQUARIAN SOCIETY, American. A society founded in 1812, which has its headquarters at Worcester, Mass. It owns a library of more than 100,000 volumes, which is especially rich in manuscripts, newspapers, political pamphlets, and early American publications. The proceedings have been published semi-annually since 1849. Seven volumes of the *Archæologia Americana* have been issued, containing special papers on antiquarian and historical topics. The society has an important museum, and maintains a fund aggregating over $100,000 for the support of various departments of its work. See the article Antiquarian Societies.

AN'TIQUARY, The. One of Scott's Waverley Novels (1816), and its chief character.

ANTIQUE' (Lat. *antiquus*, old). As the term "ancients" is commonly applied to the Greeks and Romans, the word antique is used with reference to their works of art, especially their incomparable sculptures. The antique style in works of art is distinguished by critics from the romantic or mediæval, and also from the modern. The sculpture of the Greeks is characterized by freshness, originality, and ideality; and the phases it underwent have their parallels in the development of the literature and general culture of that people. In the earliest times, the statues had a rigid, formal character, and looked more like the idols of barbarous nations than deities in human form; then came stern, Titan-like forms, corresponding with the Prometheus of Æschylus; next, the sculptures of Phidias, Polycletus, and Polygnotus, like the characters in the dramas of Sophocles, present to us humanity in its purest and noblest ideal forms. Then, as Euripides in poetry left the old domain of destiny, and derived motives and action from ordinary human passions, so statuary descended from the ideal to a closer resemblance to the forms of actual life, as we see in the works of Praxiteles and Lysippus. Afterward, when Aristophanes introduced comedy, forms of every-day life began to appear in sculpture; and thus a gradual transition was made from the art of the Greeks, which was ideal in the true sense of the word, to that of the Romans, which was real, monumental, and portrait-like. The Romans were the realists of the ancient world; their indigenous philosophy was of a popular kind; their poetry, so far as it was national, was satiric and dramatic; and their works of art may be regarded as monuments and portraitures of real life, quite suitable for a nation of soldiers, lawyers, and politicians, but vastly inferior to the ideal beauty displayed in the best period of Grecian art.

ANTIQ'UITIES. See Archæology.

AN'TI-RENT'ISM. A movement, partly political, extending over the years 1839-47, among the leaseholders in Albany, Columbia, Delaware, Montgomery, Rensselaer, and other counties in New York State. These leaseholders held their land under a sort of feudal tenure, in spite of the virtual abolition in 1775 of many of the old manorial and patroonship rights (see Patroons), the various farms being leased, for the most part, either in perpetuity or for a period of two or three lives, while the ground-rents were generally paid in kind and certain feudal services were not infrequently exacted. As the population increased, such an arrangement grew exceedingly irksome to the tenants, who were nominal but not real owners, and who could not, as a rule, transfer their titles without paying to the landlords a portion (usually a quarter) of the amount received. The crisis came in 1839, when Stephen Van Rensselaer (q.v.), one of the largest landholders, died. He had been remiss in collecting his rents, and his heirs served writs of ejectment on tenants in Albany County. The tenants thereupon resisted, and on several occasions the resulting disturbances were so serious that the militia had to be called out. By 1842 the trouble had spread to other manors. Anti-rent associations were formed over most of the leasehold districts, rents were withheld, and evictions resisted, while the grievances of the tenants were aired in newspapers devoted to their interests and in memorials to the Legislature.

The question became political and was fomented by agitators for their own special purposes, the anti-rent party ultimately controlling the legislative delegations of eleven counties. Lawlessness became prevalent, and bands of men, absurdly disguised as "Indians," assaulted, tarred and feathered, and, in several instances, murdered, deputy sheriffs and their assistants. A law passed by the Legislature against men appearing in public in disguise proved ineffectual, and on August 7, 1845, O. N. Steele, a deputy sheriff of Delaware County, was surrounded and shot down by disguised men while serving a process. Governor Wright forthwith put the county under martial law, and arrested over one hundred men, of whom fifty were convicted, twenty being sent to the State prison and two sentenced to death. The death penalty was commuted for life imprisonment, and eventually all of the prisoners were pardoned by Governor Young. The repressive measures broke up the unlawful resistance, though they caused the defeat of Governor Wright by John Young, the anti-rent candidate, at the next election. In 1846 an article was inserted in the State Constitution abolishing all feudal tenures and forbidding future leases of agricultural land for more than twelve years. Consult: Cheyney, *The Anti-Rent Agitation* (Philadelphia, 1887), and Murray, *The Anti-Rent Episode in New York*, in the "Report of the American Historical Association for 1896"; also Alexander, *Political History of the State of New York*, vol. ii. (New York, 1906).

AN'TIRRHI'NUM. See Snapdragon.

AN'TISAB'BATA'RIANS (*anti* + Gk. *σάββατον*, *Sabbaton*, Sabbath). Those who recognize no obligation to observe either the Jewish Sabbath or the Christian Lord's Day, deeming any one day as sacred as another.

ANTISANA, ăn'tē-sä'nȧ. A volcanic peak of the Andes in Ecuador, 45 miles southeast of Quito, and over 19,000 feet high (Map: Ecuador, B 3). Signs of volcanic activity appeared in 1803 during the eruption of Cotopaxi. Tambo de Antisana, one of the highest settlements on the globe, is on the slope of the Antisana.

AN'TISCORBU'TICS. See Scurvy.

AN'TI-SEM'ITISM (*anti* + *Semites*, i.e., Jews). A movement based on race hatred of the Jew, due to social and economic causes, in Germany, Austria, and France, and partly also to political causes in Russia. The movement has crystallized in some countries into an anti-Semitic political party. A political party organized in Berlin in 1879 sought to place Jews under political disabilities. The leaders of the party were Stöcker, court preacher of Prussia and a so-called Christian Socialist; Professor Treitschke, of the University of Berlin, an historian and deputy in the Reichstag; and Dr. Dühring, author of treatises on history and philosophy. Throughout 1879 and 1880 these men, through the press, in speeches, and in various ways, deplored the presence in Germany of an active, wealthy, and powerful people, incapable of assimilation, who are opposed to Christian civilization in all its phases. The matter was brought to a vote in the Reichstag in 1880; but that body declared itself in favor of economic and religious liberty by a decisive vote. The Anti-Semitic Party became a strong one in the Reichstag, however, in the early nineties. In France the Anti-Semitic propaganda was begun by Edward Drumont, editor of *La Libre Parole*, about 1882, and reached a climax in the *affaire Dreyfus*. See Dreyfus.

Since its organization in Germany the Anti-Semitic Party has been organized in Russia, Austria, Greece, and Holland. As the Jews in Russia are to a great extent kept out of the ordinary trades, many of them have resorted to the business of money lending, and by means of mortgages placed to secure loans they have obtained control of small landed properties. This fact, coupled with religious prejudice, caused the Anti-Semitic movement in Russia, about twenty years ago, to assume a most violent form. Laws preventing them from entering professions and from living in places other than towns and hamlets were vigorously enforced. In some cities, where a majority of the people were Jews, they were expelled without warning. The Anti-Semitic agitation led in April, 1903, to a terrible massacre of Jews at Kishinev in Southern Russia; in 1905 and 1906 sporadic attacks upon the Jews, resulting in loss of life and destruction of property, occurred in various Russian cities. The persecution of the Jews in Russia and Rumania has caused an emigration on a vast scale, especially to the United States and South Africa. Consult Lazare, *Anti-Semitism* (New York, 1903). See Jews.

AN'TISEP'TIC (*anti* + Gk. *σήπειν*, *sēpein*, to make rotten, to cause decay). In the arts, any substance which arrests fermentation and decay; in medicine, any agent which arrests the development and growth of micro-organisms. A *germicide* is a substance or agency which destroys these micro-organisms. A *disinfectant* destroys the organisms, and at the same time removes the noxious products of fermentation and putrefaction. The conditions which favor putrefactive change are a moderate degree of warmth, air, and the presence of moisture and micro-organisms. Measures which tend to limit the action of any of these agencies are antiseptic in character. Cold acts as an antiseptic, by bringing the article to be preserved to a temperature at which the putrefactive bacteria can no longer act. In the preservation of canned goods another principle is employed, that of exclusion of air. The cans, with their contents, are heated, and when all air has been expelled the tops are soldered on. The principle of excluding moisture is employed in the processes of drying meats, fruits, and vegetables. The action of micro-organisms is often combated directly by the introduction into preserved foodstuffs of such antiseptic substances as boric and salicylic acids and formaldehyde. They are considered injurious, however, and their use is forbidden by law in many States. Besides the antiseptics proper, a number of the more common substances, such as common salt, sugar, alcohol, and saltpetre, are used in food preservation. On the other hand, antiseptics are used for other purposes besides the preservation of foodstuffs. Thus the preservation of sizes used in paper-making is effected by the addition of sulphurous acid, and the preservation of the commercial gums and pastes by carbolic acid and oil of wintergreen. The preservation of wood from decay by impregnation with tar, creosote, carbolic acid, and corrosive sublimate is also practiced to a considerable extent.

In scientific laboratories antiseptics like alcohol and formaldehyde are largely employed in the preservation of anatomical and biological specimens. In surgery the application of antiseptics, first introduced by Sir Joseph Lister, is a matter of greatest moment. It is an understanding of the use of antiseptic and germicidal agencies that has brought about the remarkable advances made by this branch of the healing art since 1880. The condition that is sought for in every surgical operation to-day is *asepsis*, or surgical cleanliness. When a substance is *aseptic* it is free from all septic micro-organisms. Instruments are generally rendered aseptic or sterile by boiling in water, by dry heat, by steam, or by washing with the chemical antiseptics, or by exposing them to moist formaldehyde vapors; dressings, by dry heat or by steam at ordinary atmospheres or under pressure; ligatures, by prolonged immersion in alcohol or other antiseptic solutions; and the skin of the patient at the site of the operation, by application, after mechanical cleansing, of a solution of carbolic acid or of corrosive sublimate. The chemical substances most commonly employed as antiseptics in medicine are carbolic acid, the bichloride, and the biniodide of mercury, formaldehyde, free chlorine, iodine, potassium permanganate, iodoform, and boric acid, and to a lesser extent the vegetable substances thymol, menthol, and eucalyptol. Consult: Gerster, *The Rules of Aseptic and Antiseptic Surgery* (New York, 1888); Rideal, *Chemical Substances used as Antiseptics and Preservatives* (New York, 1904). See Bacteria; Microbe; Koch, Robert; Pasteur; Wound.

AN'TISLAV'ERY SOCI'ETY, The American. An association organized in Philadelphia, December, 1833, by delegates from the few State or city societies in the United States. The first Antislavery Society was formally organized at Boston in January, 1832, William Lloyd Garrison being the leader of the movement. The American Antislavery Society took the boldest ground in favor of the immediate abolition of slavery, and its work was for many years looked upon as fanatical, or at least hopelessly impracticable, its members were denounced, its meetings broken up, and rewards offered in the South for its leaders alive or dead. Divergence of opinion on the question of political action caused a split in the society in 1840. The non-voters under Garrison, although but a small portion of the Abolitionists, gained control of the old society. The others formed the American and Foreign Antislavery Society, but the movement had outgrown a society formation and found a better and more conservative expression in the Liberty Party (q.v.) and its successors. Among the prominent Abolitionists were William Lloyd Garrison, Wendell Phillips, Samuel J. May, Lucretia Mott, Lydia Maria Child, Arthur Tappan, James G. Birney, John G. Whittier, William Goodell, Gerrit Smith, and William Jay. The parent society continued to exist until after the adoption of the fifteenth amendment, in 1870, remaining small in numbers but largely influential in its propagandist work. For a partial bibliography of the movement see the biographical sketches of the leaders here mentioned. See ABOLITIONISTS; SLAVERY.

AN′TISPASMOD′IC (*anti* + Gk. σπασμός, *spasmos*, convulsion, spasm). Any drug that has a sedative effect upon the nervous system, either by depressing the brain or spinal cord or by stimulating inhibitory centres, and so regulating the production of nerve force. The former class includes the bromides and chloral. The stimulating antispasmodics are asafetida, belladonna, camphor, Hoffman's anodyne, hops, musk, and valerian. As a class, they are employed in conditions of nervous excitation, particularly of a hysterical nature, in asthma, alcoholism, and in convulsions from epilepsy and other causes.

ANTIS′THENES OF ATH′ENS (born about 444 B.C.). The founder of the Cynic School of Greek philosophy. He studied under the Sophist Gorgias, and was a disciple and ardent follower of Socrates. He wrote a large number of philosophical works, and for many years taught elocution and philosophy. Antisthenes regarded freedom and happiness as attainable only through virtue; but the meaning of his doctrine is ambiguous until the definition of virtue is given. In this Antisthenes followed Socrates' eudæmonistic principles. For Antisthenes, however, virtue was not in doing good for its own sake; the object of virtue was to render man as independent as possible of the events of life, and this freedom was attainable by reducing the wants of life to what is absolutely inevitable, viz., the wants of hunger and love. Customary morality and the demands of decency, as well as the pleasures of life, both material and intellectual, were ridiculed by Antisthenes and his followers and denounced as depriving man of his freedom, and hence, as leading to nothing but unhappiness. Nevertheless, the Cynic was not inconsistent when he advocated a philosophic culture; but this culture was to be looked upon as a means, and not as an end; it was desirable not for its own sake, nor for the sake of the intellectual pleasure which it could afford, but as leading our intelligence to avoid consistently the artificial enjoyments of civilized life.

ANTIS′TROPHE (*anti* + Gk. στροφή, *strophē*, a turning, strophe, stanza). A stanza or portion of a poem following the strophe, and responding to it. Or when the same word or phrase is used at both the beginning and the end of a clause or sentence; as,

"Fare thee well; and if forever,
Still forever fare thee well."

ANTITH′ESIS. See RHETORIC, FIGURES OF.

AN′TITOX′IN (*anti* + *toxin*; Gk. τοξικόν, *toxikon*, poison for the arrow, from τόξον, *toxon*, bow). During the course of diseases caused by bacterial infection, certain poisons (toxins) are developed in the blood by the bacteria, or exist in the bodies of the bacteria. Nature, in combating the disease, produces certain principles in the serum of the blood of the patient, called antitoxins, which antagonize the action of the toxins. These principles have not been isolated, but they are used to combat disease artificially by injecting blood serum which contains them into the tissues of a person suffering with a bacterial disease, to aid him in neutralizing the toxins resulting during that disease. Antitoxins combating the poisons of snake-bite, pneumonia, tuberculosis, yellow fever, bubonic plague, cholera, and other ailments have been prepared and used. The one most often employed is the diphtheria antitoxin, which is frequently called simply antitoxin. See BACTERIA; DIPHTHERIA; SERUM THERAPY.

AN′TI-TRADE′ WINDS. See WINDS.

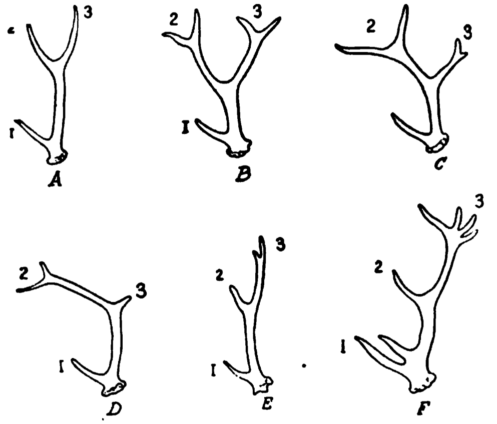
AN′TITRIN′ITA′RIAN (*anti* + *trinitarian*, from Lat. *trinitas*, triad, trinity). One who denies the doctrine of the Trinity. An Antitrinitarian differs from a Unitarian only in this respect, that his objection to the doctrine in question is made on philosophical, while that of the latter is made on theological, grounds.

AN′TITYPE (*anti* + *type*; Gk. τύπος, *typos*, an impression, model, pattern). The fulfillment of the type. Thus, David is often regarded as a type of Christ, who is, therefore, the antitype. The sacrificial offerings of the Old Testament were types of Christ as the one perfect sacrifice, and he is their antitype. See TYPE.

ANTIUM, ăn′shĭ-ŭm (now Anzio, formerly Porto d'Anzio). One of the most ancient cities of Latium. It stood on the coast, about thirty-four miles from Rome, and, being favorably situated for commerce and piracy, it was under the Volscians, into whose hands it had fallen, one of the most powerful enemies of rising Rome, until finally subdued (338 B.C.). It became a favorite resort of the wealthy Romans, and some of the most famous remains of ancient art have been discovered among the ruins of their villas and palaces, such as the "Apollo Belvedere" in the Vatican, and the "Borghese Gladiator" in the Louvre. It was the birthplace of the emperors Caligula and Nero, and the latter constructed a splendid port by means of two moles enclosing a basin two miles in circumference. Remains of the moles still exist, although the basin is mostly filled up with sand. In the ninth and tenth centuries the town was made desolate by the raids of the Saracens. Its site is now occupied by Anzio (q.v.), a favorite bathing resort for the inhabitants of Rome, with some charming villas.

ANT'LERS (O. E. *auntlere,* O. F. *antoiller,* from Lat. *ante,* before + *oculus,* eye). The horns of (male) deers. For their structure, etc., see DEER. In the language of British stag-hunting, each part of the horn and each stage of growth receives a name, and many of these names serve to designate a deer of a certain age or fitness. These names are derived from and specifically apply to the European red deer (*Cervus elephas*), now preserved in many parts of Europe for the sport of stag-hunting; and they have descended from ancient terms, mostly French, originating on the continent in mediæval times. The following is a summary given by Professor A. H. Garrod in *Cassell's Natural History,* Volume III.

"In the common red deer, in the spring of the year following its birth, the antlers are nothing more than straight, conical, and unbranched 'beams,' the animal being then known as a 'brocket.' In the following spring the antler has, besides the 'beam,' a small branch from its base, directed forward, known as the 'brow antler;' it is then termed 'spayad.' In the third year an extra front branch is formed, known as the 'tres,' and the whole antler is larger. The tres is sometimes seen in the smaller antler of the spayad. In the fourth year the brow antler is doubled to form the 'brow' and 'bez-tyne,' at the same time that the top of the main beam divides into the 'sur-royals' of the 'staggard,' or four-year-old male. In the fifth year the sur-royals become more numerous, the whole antler of the 'stag' being heavier than previously, only to be exceeded in weight by those of the fully adult 'great hart' with ten or more 'points,' each being larger and longer than the year before."



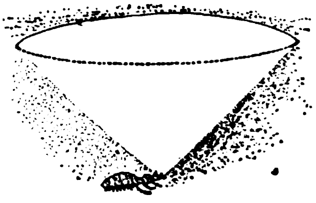
TYPES OF ANTLERS.

a, Rusine. *b,* Normal rucervine. *c,* Intermediate rucervine. *d,* Extreme rucervine. *e,* Sub-elaphine. *f,* Elaphine. 1, Brow-tyne. 2, Tres-tyne. 3, Royal-tynes.

In Scotland a deer with twelve points is known as a "royal stag;" but this number is sometimes exceeded. The finest heads are no longer seen in Great Britain, where the habit of shooting the best is leading to deterioration, and fossil antlers from British caves and peat-beds are larger than those of any living individuals, rivaling those of the wapiti in size. Great heads have been obtained within recent years on the vast wild estates of eastern Europe. In many of the old German castles superb heads of sixty or more points are preserved; and Lydekker mentions one shot in Transylvania which had forty-five points and weighed seventy-four pounds. It should be said, however, that this excessive number of points is the result of injury or disease when the horn was growing, so that a large, symmetric pair with more nearly the normal number of tines is a really better example.

The material of antlers is highly durable, and enters extensively into the arts for making handles of knives, umbrellas, etc., and various ornamental articles.

ANT'-LI'ON. The larva of any insect belonging to the neuropterous family Myrmeleonidæ. The kinds commonly referred to are only those which form pitfalls, and not the members of the family in general, all of which do not possess this habit. The conical pitfalls which are used to aid in the capture of ants and other small ground insects are excavated in sand, dust, and the powdered remains of decayed logs. Their size varies with that of the ant-lion, but they are commonly about one and one-half inches across the top. There are two methods used in the formation of these traps. The simplest trap is excavated by powerful upward tossings of the head after the larva has buried itself below the surface; thus, a funnel-shaped pit is formed. The second method is by crawling backward in a spiral direction just beneath the surface, and by means of the head tossing the sand to the outside. In the bottom of these conical pits the larvæ bury their whole body except their mandibles, which are spread ready for their prey. An ant, for example, strolling about and stepping on the margin of the pit starts a miniature landslide on account of the looseness of the material in which the pit is excavated. This arouses the ant-lion, which begins actively to throw material from the bottom of the pit, thus accelerating the landslide and bringing the ant within reach of the jaws, which seize it and relax only after extracting the juices from the body. The scissors-like jaws are grooved on their inner side, and thus by opposition a tube is formed through which the juices are sucked. The carcass, extracted of its juices, is tossed outside of the pit. The posterior part of the intestine of the ant-lion is remarkable for being modified to form a spinning gland or organ. The adult ant-lion spins a cocoon by the aid of sand, etc., in which it transforms to the imago state. The "flies" have four expanded net-veined wings, which are folded over the abdomen when at rest. In most of the species the wings are transparent. About fifty species are found in the United States, most frequently in sandy or semi-arid regions.



ANT-LION.

Showing the conical Pit with the Larva waiting for its Prey.

ANTOFAGASTA, ăn'tô-fȧ-gäs'tȧ. A port and the capital of the Chilean province of the same name (Map: Chile, C 8). Founded in 1870, it increased rapidly in importance, despite its poor harbor, owing to the saltpetre deposits in the neighborhood and to the rich silver mines of Caracoles, with which it is connected by railway. Pop., 1885, 7600; 1903, 16,253.

ANTOFAGASTA. A northern province of Chile, bounded on the north by the province of Tarapacá, on the east by the republic of Argentina, on the south by the province of Atacama, and on the west by the Pacific Ocean. It has an area of over 46,609 square miles. Taking in a large part of the Atacama Desert, the surface is mostly mountainous and barren, and interspersed with salt lagoons and marshes. It contains a number of volcanoes, and has large deposits of silver, borax, guano, and saltpetre. Notwithstanding the phenomenal increase in the population of the province between 1885 and 1903 (from 21,213 to 53,188), on account of new mineral discoveries, Antofagasta is still one of the most sparsely populated provinces of Chile, its density being 1.54 to the square mile. This territory was ceded to Chile by Bolivia as a result of the war ending in 1883. The capital and chief seaport is Antofagasta (q.v.).

ANTOINE, äN'twän', ANDRÉ (1858—). A French actor and theatrical manager, founder of the Théâtre Libre (q.v.).

ANTOINE, JULES DOMINIQUE (1845—). One of the principal representatives of the opposition party in Lorraine. He was born at Metz, and served in the Franco-German War as officer of the *Garde Mobile.* After the war he became prominent in Metz as an exponent of the Anti-German sentiment in the Municipal Council and the local diet. In 1882 he was elected representative to the Reichstag, but after a fruitless attempt to deliver an address in French before that body, abstained almost altogether from attending the sessions. He was reëlected by his constituents in 1884, and in 1887. He was tried for treason and sentenced to permanent exile (1889), and became a naturalized citizen of France.

ANTOINE DE BOURBON, äN'twän'de bōōr' bôN' (1518-62), King of Navarre. He was born in Picardy, the son of Charles of Bourbon. In 1548, Antoine, then Duke of Vendôme, married Jeanne d'Albret, the heiress of Navarre, and through her became King of Navarre and Lord of Béarn (1555). He was feeble and irresolute, and fluctuated between the two religious parties in France. At the beginning, he sided with his brother Louis, Prince of Condé, and was involved in the conspiracy of Amboise, but, in 1561, he was made Lieutenant-General of France, and, embracing Catholicism, soon formed a coalition with the Duke of Guise, and the Constable of Montmorency. He received command of the royal army besieging Rouen, and there met his death in an assault on the city (November 17, 1562). Antoine de Bourbon is best known as the father of Henry of Navarre, who became Henry IV. of France. See BOURBON, HOUSE OF.

ANTOKOLSKI, än'tō-kōl'skē, MARK MATVEYEVITCH (1842-1902). A Russian sculptor. He was born at Vilna of poor Jewish parents, and at the age of twenty-two attracted the attention of Professor Pimenoff, who admitted him as a "free listener" (special student) to the Academy of Fine Arts at St. Petersburg. At the academic exhibition of 1864 he received the second silver medal for the wood-carving entitled "The Jewish Tailor." In the following year his production, "The Miser" (executed in ivory), secured for him the large silver medal of the Academy and a stipend from the Emperor. These creations were followed by "The Judas Kiss" and a group modeled in clay, "The Descent of the Inquisition upon a Jewish Family at the Feast of Passover." In 1871 he completed his famous statue, "Ivan the Terrible," for which he was appointed an academician by the Emperor Alexander II., who bought the statue and ordered a bronze casting of it for the Hermitage at St Petersburg. Among the other great sculptures of the artist may be mentioned: "Peter the Great" (1872, a colossal figure): "Christ Bound Before the People" (1874), "The Death of Socrates" (1876), "The Last Sigh" (1878), "Mephistopheles" (1881), "Spinoza" (1882), "Yermak" (the Cossack conqueror of Siberia), "The Sleeping Beauty" (1900). At the Paris International Exposition of 1878 Antokolski was awarded the first prize for sculpture, and two years afterward he settled permanently in Paris. He was a Chevalier of the Legion of Honor.

ANTOMMARCHI, än'tôm-mär'kē, FRANCESCO (1780-1838). The physician of Napoleon at St. Helena. He was born in Corsica, studied medicine at Pisa, and afterward practiced in the Santa Maria Hospital at Florence. At the request of Napoleon's mother, he was induced by Cardinal Fesch to succeed Dr. O'Meara as the attendant physician of the Emperor at St Helena. At first there was little cordiality between the two; but subsequently Napoleon conceived a high regard for his countryman and at his death left him 100,000 francs. He afterward declared that the death of Napoleon had not been caused by cancer of the stomach, but by a malignant fever peculiar to the island, and he refused to sign the *post-mortem* certificate. In 1830 Antommarchi displayed what he represented to be a death mask of Napoleon. The likeness was considered accurate by many, but the phrenologists found fault with the contour of the cranium, and doubt was cast upon the genuineness of the mask. Nevertheless, it forms the model from which many busts of Napoleon have been made. At the outbreak of the Polish revolution, in 1830, Antommarchi went to Warsaw, and soon afterward returned to France, whence, in 1836, he proceeded to America. He died at San Antonio, Cuba. He published *Les derniers moments de Napoléon* (Paris, 1823).

ANTONELLI, än'tō-nĕl'lē, GIACOMO (1808-76). An Italian cardinal and statesman, born at Sonnino. At the Seminary in Rome he became conspicuous for intellectual capacity, and Pope Gregory, recognizing his ability, attached him to his suite. He became under-secretary in the Ministry of Interior in 1841, and in 1845, Minister of Finance. At the accession of Pius IX. he joined the Pope's reformatory schemes and gained great influence, becoming cardinal in 1847 and a member of the Ministerial Council through which Pius undertook to establish his reforms. In 1848, when the ministry of priests and laymen was established, Antonelli became prime minister. After the Pope's pronouncement against the war with Austria (1848), Antonelli resigned, but afterward, when he had perceived the Pope's motive, he abandoned his national policy and associated himself entirely with the conservative element. Upon the reëstablishment of the Papal power through the intervention of France, Antonelli returned to Rome with the Pope (1850) and reorganized the administration along strictly absolutistic lines. He rejected all advances of the Powers recommending opportunistic reforms, and would not yield to the nationalistic aspirations of the Italians. He raised vain protests against the aggrandizement of the royal territories at the expense of the Papal States. During the closing years of his life he lost his influence with the Pope, who yielded more and more to the Jesuit element. At his death he was prime minister to the Pope. He left his property, amounting to about $8,000,000, to his three brothers, and his alleged daughter, the Countess Lambertini, vainly sued for a share.

ANTONELLO DA MESSINA, ăn′tō̇-nĕl′lō̇ dä mĕs-sē′nȧ (c.1447-93). An Italian painter of the Renaissance, reputed to have been the introducer of oil painting into Italy. According to the formerly accepted account of Vasari, he was born at Messina, studied at Rome, and then practiced in Palermo and in his native town; seeing a picture by Jan van Eyck while on a visit to Naples, he went to Flanders and learned from him the secret of oil painting, which he then introduced into Venice. But as van Eyck died before Antonello's birth, and for other weighty reasons given by Morelli, it seems more likely that he acquired his art from some Flemish master in Italy. About 1470 he removed to Venice, where he was the means of introducing oil technique, and was in turn influenced by Giovanni Bellini. His earlier works are Flemish in character, the principal ones being a "Salvator Mundi" in the National Gallery, London, and a small "Crucifixion" in the Antwerp Gallery. Among the works of his Venetian period are a "Dead Christ" (Vienna) and a "Saint Sebastian" (Berlin); of his portraits, which are always admirable, three heads of young men, in London, Paris, and Berlin. Other male portraits are in the Trivulzi Collection (Milan) and the Borghese Palace (Rome). His art is characterized by a strong realism, and he excels especially in portraiture. Consult Morelli, *Italian Painters* (London, 1892).

ANTO′NIA MA′IOR (B.C. 39—?). The elder of the two daughters of Mark Antony and Octavia, and grandmother of the Emperor Nero. Her son, C. Domitius, was Nero's father. Her husband was L. Domitius Ahenobarbus.

ANTO′NIA MI′NOR (c. 36 B.C.—38 A.D.). Sister of Antonia Maior, mother of the Emperor Claudius, and grandmother of Caligula. Her husband was Drusus, brother of the Emperor Tiberias. Caligula at first treated her with respect, but afterward subjected her to indignities.

ANTONIDES, ȧn-tō′nė-dâs, Joannes (1647-84). A Dutch poet. He was born in Goes, and was educated at the expense of one of the chiefs of the admiralty at Amsterdam. He was the foremost pupil of Vondel, whom he resembled in poetical ability, although his works are marred by turgidness and monotony. He is best known by his poems, and a tragedy written at the age of nineteen, called *Trazil of overrompelt Sina* ("The Conquest of China"). His fame was fully established by the publication, in 1671, of *Ystroom*, an epic on the River Y.

AN′TONI′NA (449-c. 565). The wife of the Byzantine general Belisarius. Though the daughter of a circus-rider, she was a favorite of Theodora, the wife of Justinian, and through the influence of the Empress reduced Belisarius to a state of servile submissiveness and impelled him to many acts of injustice. In connection with his public career, however, she frequently showed great foresight and diplomacy. See Belisarius.

AN′TONINE COL′UMN. The column of Marcus Aurelius in Rome. It was erected in 176 A.D. to commemorate that emperor's victories in his German and Sarmatian wars. The column stood in a square surrounded by a portico, and was part of a superb group of monuments to commemorate the Antonine dynasty, similar to the column of Trajan, which it imitated, having the same height (100 feet), and reliefs similarly arranged in ascending spirals, giving the history of the campaigns. It now adorns the Piazza Colonna.

AN′TONINES, Age of the. The period in Roman history marked by the reigns of Antoninus Pius and Marcus Aurelius Antoninus (A.D. 138-180). It was noted for its peace and prosperity.

AN′TONI′NUS, Marcus Aurelius. See Aurelius, Marcus Antoninus.

ANTONINUS, Saint (1389-1459). An archbishop of Florence. His real name was Antonio Pierozzi, and he is also known by the name of De' Forciglioni. At first prior to several monasteries, he was, in 1446, appointed to the archbishopric of Florence, where his noble efforts tended greatly to alleviate the sufferings attendant upon the pestilence, famine, and earthquake of the period 1448-53. He was canonized by Pope Adrian VI. in 1523. The 2d of May is consecrated to his memory in the Roman Catholic Church. The most important of his writings are: *Summa Theologica*, a compilation of ethical precepts, after Thomas Aquinas; *Summa Confessionalis; Summa Historialis*, a chronicle; and *Lettere* (Florence, 1859). A monument to him was erected in Florence, and his cell in the monastery of St. Mark's is still pointed out.

ANTONINUS, Itinerary of (Lat. *Antonini Itinerarium*). A valuable geographical work, containing the names of all the places and stations on the principal and cross roads of the Roman Empire, with their distances from each other in Roman miles. It has been usually attributed to the Emperor M. Aurelius Antoninus (Caracalla), whence its name. The testimony, however, of the Greek geographer Æthicus, author of the *Cosmographia*, assures us that a general survey of the Roman Empire was commenced 44 B.C., in the consulship of Julius Cæsar and M. Antonius, and completed in the reign of Augustus, when the results of the survey received the sanction of the State. These results, it is with some probability inferred, are embodied in this *Itincrary*, which, it is further supposed, received additions and amendments in the time of the Antonines. Subsequent improvements went down to the reign of Diocletian. The best editions are those of Wesseling (Amsterdam, 1735) and Parthey (Berlin, 1848). Consult D'Urban, *Recueil des itinéraires anciens*, with ten maps (Paris, 1845).

ANTONINUS. The name of several Roman emperors, who are to-day generally distinguished by their titles or nicknames. See Antoninus Pius; Aurelius; Caracalla.

ANTONINUS, Wall of (Lat. *Antonini vallum*). See Roman Wall.

ANTONINUS AND FAUSTI'NA, Temple of. A prostyle temple in Rome, on the Sacred Way facing the Forum, voted by the Senate in 141 A.D., in commemoration of the elder Faustina, wife of Antoninus Pius, whose name was added to that of his wife on his death in 161 A.D. The temple has six columns in front and three on the sides. The frieze is richly sculptured. In the seventh or eighth century the temple was dedicated to St. Laurence under the title of San Lorenzo in Miranda. Urban V. used much of its material in the reconstruction of the Lateran.

ANTONINUS LIB'ERA'LIS. A Greek writer on mythology, who lived about 150 A.D., and is supposed to have been a freedman of Antoninus Pius. He wrote *Μεταμορφώσεων συναγωγή* (*Metamorphōseōn Synagōgē*), a collection of forty-one myths dealing with transformations. Most of these are derived from ancient sources, now lost, so that the work is valuable.

ANTONINUS PI'US, Titus Aure'lius Fulvus Boionius Arrius (86-161 A.D.). A Roman emperor (138-161 A.D.), who was born at Lanuvium in the reign of Domitian. The family of Antoninus Pius was originally from Nemausus, now Nîmes, in Gaul. Antoninus Pius inherited great wealth, and early gave proof of excellent qualities. In 120 he was made consul; afterward he was sent by Hadrian as pro-consul into Asia, where the wisdom and gentleness of his rule won for him a higher reputation than had been enjoyed by any of his predecessors. By his wife, Faustina, he had four children, of whom three died, leaving a daughter, Faustina, afterward wife of Marcus Aurelius. In 138 he was adopted by the Emperor Hadrian, in consequence of merit alone, and came to the throne in the same year. The reign of Antoninus Pius was peaceful and happy. In his private character he was simple, temperate, and benevolent, while in public affairs he acted as the father of his people. The persecution of the Christians, which was continued during his reign, was partly stayed by his mild measures. He was little engaged in war, excepting in Britain, where he extended the power of Rome and built a wall between the Forth and the Clyde, as a defense against invasions by the predatory inhabitants of the north. The reign of Antoninus Pius illustrates the saying, "Happy the nation which has no history," for by the justice, wisdom, kindliness, and courtesy of the Emperor his vast empire was preserved from the crimes, conspiracies, insurrections, and bloodshed, the recording of which formed the largest part of the historian's work in the dark centuries of the Roman Empire. It is said that only one senator was impeached during the life-time of Antoninus Pius. Literature received great encouragement; the laws were improved, commerce extended; the means of communication were facilitated by the repair of roads, bridges, etc.; new sanitary regulations were introduced, and a taste for architecture fostered in the citizens. The epithet Pius, "dutiful," was conferred on him on account of his conduct in defending the memory of his predecessor, Hadrian, against certain dishonoring charges brought forward by the Senate. The column raised to his memory by his adopted son and successor, Marcus Aurelius Antoninus (q.v.), was discovered in 1709, but exists only in fragments. The so-called Column of Antoninus, now in the Piazza Colonna at Rome, is that raised by the Senate in honor of Marcus Aurelius after his victory over the Marcomanni.

ANTO'NIO. (1) The Changeling in Middleton's play of the same name. (2) The steward in Webster's *Duchess of Malfi.* (3) The Duke of Milan in Shakespeare's *Tempest.* (4) The Merchant of Venice in Shakespeare's play of the same name, who, unable to repay money borrowed of the Jew Shylock, becomes liable for the stipulated forfeit, a pound of flesh.

ANTONIO, ȧn-tō'nē-ō, Nicolas (1617-84). A Spanish bibliographer and critic. In 1659, Philip IV. made him his general agent at the court of Rome, where he remained nearly twenty years, and employed most of his time on his great work, which was a complete list of Spanish authors and a catalogue of their writings. He published part of it in 1672, under the title, *New Spanish Library,* and in 1696 the *Old Library* appeared. About 1677, he was fiscal for the Royal Council in Madrid. His *Bibliotheca Hispanica* is considered by some critics the most comprehensive work on Spanish literature. He also wrote a critique on fabulous histories.

ANTONIO DE SEDILLA, dā sȧ-dē'lyȧ (c.1730-1829). A Spanish missionary priest, better known as "Père Antoine." In 1779 he was sent to New Orleans to reinaugurate the Inquisition there, but was immediately sent back by Governor Miro, who felt that the enforcement of Spain's rigid laws against heretics would precipitate a revolution. Père Antoine returned to New Orleans in 1783 as priest of the St. Louis cathedral, and by his kindness and his numerous charities earned the love of the residents, especially of the French element. Until 1886, a palm tree planted by him was a landmark in New Orleans, and about it clustered many picturesque traditions, some of which are given in Gayarré, *History of Louisiana,* 3 volumes (New York, 1846-53). Consult also T. B. Aldrich's story, *Père Antoine's Date Palm.*

ANTO'NIUS, Gaius, surnamed Hybrida. A Roman consul, son of Marcus Antonius the orator, and uncle of Mark Antony. He was Cicero's colleague in both the prætorship (65 B.C.) and the consulship (63). Though at first one of Catiline's conspirators, he was induced to desert him by Cicero, who secured for him the province of Macedonia. On his return to Rome (59), he was accused of having taken part in Catiline's conspiracy and of extortion in his province, and, though defended by Cicero, was condemned on both charges. He then retired to the island of Cephallenia, but was recalled, probably by Cæsar, and was in Rome at the beginning of 44 B.C.

ANTONIUS, Marcus (143-87 B.C.). One of the most eloquent of Roman lawyers and speakers, commonly called "the Orator." He was the grandfather of Mark Antony, the triumvir. He was prætor in 104 B.C., and the following year governor (*legatus pro prætore*) of Cilicia; in 99 he held the consulship. He favored the aristocratic party, and was an adherent of Sulla in the Civil War against Marius, by whose order Antonius was assassinated. In the judgment of Cicero, Antonius and L. Crassus were the first Roman orators who equaled the great speakers of Greece.

ANTONIUS, Marcus (83-30 B.C.). A Roman triumvir, commonly known as Mark Antony, a descendant of one of the oldest patrician families. He was the son of the prætor, M. Antonius Creticus, and on the side of his mother, Julia, was related to Julius Cæsar. His youth was wasted in dissipation, and, finding himself pressed by numerous impatient creditors, he escaped to Greece in 58 B.C., where, for a short time, he listened to the teaching of Athenian philosophers and orators. His studies here were soon interrupted by the pro-consul Gabinius, who appointed him leader of his cavalry. In the campaign against Aristobulus in Palestine and in Egypt, Antonius distinguished himself by his courage and activity, and ingratiated himself with the soldiers. After assisting Cæsar in Gaul, he went to Rome, in 50 B.C., to advance the interests of the former, who stood in great danger from the hostility of the oligarchical party, and was appointed an augur, and chosen one of the tribunes of the people. In the following year, on account of his adherence to the party of Cæsar, he was expelled from the curia and fled to Cæsar, who made use of this event as a pretext for his war against Pompey. At the outbreak of this war Antonius received the appointment of commander-in-chief in Italy. In the battle of Pharsalia he commanded the left wing of Cæsar's army. In 47, he was made master of the horse by Cæsar, who left him to govern Italy during his absence in Africa. Antony, as usual, disgraced himself; was perpetually drunk; divorced his wife and married an actress, with whom he paraded himself offensively through the chief towns of the peninsula. In 44 B.C. he married Fulvia, the widow of Clodius; was made consul, and vainly endeavored to prevail on the Romans to recognize Cæsar as emperor. After the assassination of Cæsar, he played the part so well described by Shakespeare, and by his funeral oration and the well-timed display of Cæsar's bloody robe so wrought upon the passions of the people that the conspirators were compelled to escape from Rome, leaving the successful orator for a while in possession of almost absolute power. A formidable rival to Antonius now appeared in the person of the young Octavianus (the future Augustus), whom Cæsar had designated as his heir, and a contest for the ascendency ensued. The eloquence of Cicero, who denounced Antonius as an enemy of the State, secured the triumph of Octavianus in the Senate. Antonius, who had been besieging Decimus Brutus in Mutina (Modena), in order to obtain possession of Cisalpine Gaul, was finally overthrown by the forces of the Senate in 43 B.C. He escaped beyond the Alps, visited the camp of Lepidus, who commanded in Gaul, and gained the favor of the army, of which he took command. Plancus and Pollio joined him with their troops, and Antonius, who so recently had escaped as a helpless fugitive from Italy, returned to Rome at the head of seventeen legions and ten thousand cavalry. Octavianus, who had pretended to maintain republican principles, now threw off the mask and held a consultation with Antonius and Lepidus near Bologna, when it was determined that as triumvirs they should share the whole Roman world among themselves. To secure their spoil, they returned to Rome and began their course of murder and robbery throughout Italy. Among their first victims fell Cicero, the orator, whose eloquence they dreaded. According to Appian, no fewer than three hundred senators and two thousand knights were put to death in the proscriptions of the triumvirs.

After making Italy safe for themselves and raising an enormous sum of money to carry on their war abroad, Antonius and Octavianus led their troops into Macedonia against Brutus and Cassius, and defeated the republican forces at Philippi (42 B.C.). Antonius next paid a visit to Athens, and then went into Asia to arrange his dispute with Cleopatra, Queen of Egypt, whose conduct had offended the triumvirs. The Queen herself appeared to answer his challenge, and captivated Antonius by her beauty and address. The general who had overcome Brutus and Cassius was now made a prisoner, though not of war. He followed Cleopatra into Egypt, and lived with her in idleness and luxury, until he was aroused by tidings of the quarrel which had taken place in Italy between his own relatives and Octavianus. This dispute gave rise to a short war, which came to an end before Antonius arrived in Italy. A new division of the Roman world now took place between the triumvirs, and was soon quietly arranged at Brundusium. Antonius took the East, and Octavianus took the West; while the ambition of the feeble Lepidus was appeased by his having the whole of Africa for his portion. Even this shadow of dominion was taken from him in 36 B.C. Meanwhile, Antonius had confirmed his friendship with Octavianus by a marriage with Octavia, his sister. He now returned to Cleopatra, resumed his former voluptuous mode of life, squandered the wealth of Rome in gifts to his royal mistress, and became guilty of gross acts of injustice. Octavianus made use of these facts to excite the indignation of the Roman people against Antonius, and a war between the rivals became unavoidable. Antonius, in his idleness, tried to postpone the trial of strength which he saw inevitably approaching, and filled the island of Samos (where his troops were quartered) with musicians, jugglers, and buffoons. Meanwhile, at Rome, he was formally deprived of his power, and war was proclaimed against Cleopatra. Each party collected its forces, and in the naval engagement which took place (31 B.C.) near Actium (q.v.) Antonius and Cleopatra were utterly defeated. His subsequent hope of finding troops still faithful to him in Libya was disappointed. He returned to Egypt, where, with Cleopatra, he once more forgot political cares and vexations, until his amusements were suddenly interrupted by the arrival of Octavianus at Alexandria. Antonius now roused himself, made a charge with his cavalry, and repelled the enemy; but the advantage was only momentary. Deserted by the Egyptian fleet, as by his own army, and suspecting that even Cleopatra had conspired against him, he went to her palace, from which the Queen had escaped. Deceived by a false message informing him of the death of Cleopatra, Antonius committed suicide by falling upon his sword, in the year 30 B.C. He died in the arms of Cleopatra, who immediately after put an end to her life.

ANTONIUS, St. See Antony of Padua.

AN'TONOMA'SIA (Gk. *ἀντονομασία*, from *ἀντί*, *anti* + *ὀνομάζειν*, *onomazein*, to name). In rhetoric, the substitution of any epithet or phrase for a proper name; as "The Stagyrite" for Aristotle, "The Little Corporal" for Napoleon, "The Man on Horseback" for Grant, "The Man from Nowhere" for Kipling, etc. Sometimes the process is reversed; as, calling a good orator a

"Cicero." In either case the figure is akin to metonymy.

ANTON ULRIC, ăn′tôn ụl′rĭk (1714-80). The second son of Duke Ferdinand Albert of Brunswick-Wolfenbüttel (till 1735 Brunswick-Bevern, the title by which the Prince was first known in Russia). He married Anna Karlovna (q.v.), niece of Anna Ivanovna, Empress of Russia, in 1739. In 1740 the Empress fell dangerously ill and appointed Ivan, the infant son of Anton, her successor, with Biron as regent. After her death Anton Ulric made some feeble attempts to reverse this appointment, which only led to the punishment of those supposed to have instigated them, and to his own military degradation. Biron's conduct toward the parents of the infant Prince became unbearably insolent, and Anna appealed in despair to General Münnich, who put a sudden end to Biron's sway and declared the Grand Duchess and her husband regents. After a few months Anna ungratefully overthrew Münnich. After his fall, as little unity prevailed among the ministers as between herself and her husband, and the Government was looked upon as both a foreign and a contemptible one. Then came the revolution of December 5, 1741, which raised Elizabeth Petrovna (q.v.) to the throne. Anton Ulric and his consort were exiled, and lived long at Kholmogory, in the government of Archangel. Anna died in 1746. Catharine II. offered Ulric his freedom, but he declined it. Ultimately he grew blind. Catharine gave his children comfortable homes in Jutland. Consult Brückner, *Die Familie Braunschweig in Russland* (St. Petersburg, 1876).

AN′TONY, St., of Thebes (251-356). The father of monastic asceticism; known as the Great. He was born about the year 251 A.D., at Koma, near Heraklea, in Upper Egypt. His parents were both wealthy and pious, and bestowed on him a religious education. Having, in obedience to what he believed to be a divine injunction, sold his possessions and distributed the proceeds among the poor, he withdrew into the wilderness, where he disciplined himself in all those austerities which have hallowed his memory in the Catholic Church and formed the model of the monastic life. When thirty years of age, however, desirous of obtaining a deeper repose than his situation afforded, he penetrated further into the desert and took up his abode in an old ruin on the top of a hill, where he spent twenty years in the most rigorous seclusion; but in 305 he was persuaded to leave this retreat by the prayers of numerous anchorites who wished to live under his direction. He now founded the monastery of Fayum, which was at first only a group of separate and scattered cells near Memphis and Arsinoë, but which, nevertheless, may be considered the origin of cenobite life. He declined, however, to preside over a monastery. The persecution of the Christians by Maximian, in 311 A.D., induced St. Antony to leave his cell and proceed to Alexandria to comfort the martyrs; but in the course of a year he returned to his solitude, which, however, he soon left and plunged yet deeper into the desert. At length he found a lodgment on a hill, about a day's journey from the Red Sea; but his disciples, discovering his retreat, so pressed him with their affectionate importunities that he ventured to accompany them back. After many pious exhortations, he once more left them, and soon became the mighty oracle of the whole valley of the Nile. In 335 the venerable hermit made a journey to Alexandria, at the request of Athanasius, to dispute with the Arians. He had interviews with Athanasius and other distinguished persons, but soon retired to his desert home, where he died, 356 A.D.

Athanasius states, in his *Life of St. Antony*, that the saint wore only a coarse shirt of hair, and never washed his body, which is more credible than the stories he relates of his encounters with the devil or his miracles. · His whole conduct indicates the predominance of a glowing and yet gloomy fancy, and a disposition to lead a life of absolute solitude. Although the father of monachism, St. Antony is not the author of any monastic "rules;" those which the monks of the Eastern schismatic sects attribute to him are the production of St. Basil. He is, perhaps, the most popular saint in the Catholic Church. Accounts of his life and miracles are given in the *Acta Sanctorum* of the Bollandists, under the date of the 17th of January, on which day his festival was kept.

ANTONY, St., of Padua (1195-1231). A famous saint. He was born at Lisbon, Portugal, August 15, 1195, baptized as Ferdinand, but took the name Antony when he entered the order of St. Francis, in 1220, after being a canon of St. Vincent's in Lisbon, and already noted for biblical and patristic learning. In 1221 he attended a meeting of the order at Assisi and made a poor impression, but soon after produced great astonishment and delight at a meeting with the Dominicans, and was sent by St. Francis as revival preacher to northern Italy, where he met with tremendous success. In 1223, after studying at St. Francis's direction mystical theology for five months, he was appointed the first theological tutor in the order, and taught in northern Italy and France. In 1227 he became provincial of northern Italy; in November of that year he entered Padua for the first time. In 1230 he went to Rome as delegate to get the papal decision upon the binding nature of certain points in the Franciscan rule—not, as frequently asserted, to secure the deposition of the general of the order. He died at Padua, June 13, 1231. He was canonized by Pope Gregory IX. in 1232. His great repute as a preacher gave rise to legends of miraculous powers. He is the patron saint of animals. Once he preached to the fishes, it is said, and they listened to him with rapt attention. Joseph Addison gave an abstract of it in his *Remarks on Italy*. For the classic biography of Antony, consult Emmanuel de Azevedo of Coimbra, *Vita del Taumaturgo . . . Sant' Antonio di Padova* (latest edition, Padua, 1829); consult also: De Chérance, *Antony of Padua* (London, 1895); I. Beale (1897), Mrs. Arthur Bell (1901), in French by A. Lepître (Paris, 1901). His works were published by Horoy in his *Medii Ævi Bibliotheca Patristica* (Paris, 1885).

ANTONY AND CLE′OPA′TRA. A tragedy by Shakespeare (1607). It was based upon the life of Antony in North's *Plutarch*, and is admired for the vigor with which the author deals with a difficult theme. The play is to some extent imitated in both Dryden's *All For Love*, and Fletcher and Massinger's *The False One*.

ANT PLANTS. See Myrmecophytes.

ANTRAIGUES, än'träg', Emanuel Louis Henri de Launay, Comte d' (1755-1812). A French publicist and diplomat. He was born at Villeneuve, department of Ardèche. His talents were first displayed in his *Mémoires sur les états-généraux, leurs droits et la manière de les convoquer* (1788), in which he predicted the downfall of absolute monarchy realized in the French Revolution. In 1789, when he was chosen a deputy, he defended, however, the privileges of the hereditary aristocracy. In 1790 he was employed in a diplomatic mission at St. Petersburg and Vienna, where he upheld the cause of the Bourbons. He incurred the displeasure of Bonaparte, but fled from France in 1798. In 1803 Alexander of Russia sent him on an embassy to Dresden, where he wrote a brochure against Napoleon, entitled *Fragment du XVIII. livre de Polybe trouvé sur le mont Athos.* He was murdered, with his wife, near London by an Italian servant.

AN'TRIM. A maritime county in the northeast of Ireland, in the province of Ulster. It is bounded, north, by the Atlantic; west, by the north part of the River Bann, dividing it from Londonderry, and by Lough Neagh; south, by Lagan River, separating it from the county of Down; southeast, by Belfast Lough; and northeast, by the North Channel (Map: Ireland, E 2). Its greatest length is 56 miles, its greatest breadth 20 miles; its extent of sea coast, 90 miles. Area, 1211 square miles. About two-thirds of this is arable; a fourth, barren; and a small fraction in woods. Mines of fine salt occur at Duncrue and Carrickfergus, and small coal fields near Ballycastle and in the interior. Rich beds of iron ore of fine quality are worked at Glenravel, and a large export is carried on from Cushendall and Carnlough. The soil of Antrim is mostly light, and the chief crop is oats. The land is much subdivided, and the raising of flax, and the various branches of the linen, cotton, and coarse woolen manufacture employ a great portion of the people. There are important salmon and other fisheries on the coast. The principal towns are Lisburn, Ballymena, Ballymoney, Carrickfergus, Larne, and Antrim; Belfast, the former capital, was constituted in 1898 into a County Borough. Pop., 1901, 196,090. In 1891 the population embraced in the present county limits was 208,010.

ANT-SHRIKE, ANT-THRUSH, and **ANT-WREN.** Names applied to groups within the large South American family of non-oscine Passeres named Formicariidæ, all of which subsist largely upon ants. Bates and others describe how these birds follow and prey upon the columns of marching ecitons and other ferocious tropical ants, and that their twittering is a warning all the natives are quick to heed. They are small, long-billed birds, clothed in soft and pleasing colors, as a rule, and some have loud and melodious voices, notwithstanding their lack of proper oscine or "singing" organs. The ant-shrikes constitute the subfamily Thamnophilinæ, or "bush-shrikes," some of which also inhabit the Antilles; ant-wrens are prettily marked, active, wren-like members of the subfamily Formicivorinæ; while the ant-thrushes belong to the typical subfamily Formicariinæ, to a Guiana species of which (*Rhopoterpe torquata*) Buffon first gave the name *fourmilier* (ant-eater). The term ant-thrush is also improperly applied to the pittas—brilliantly colored, ground-keeping, insect-eating birds of eastern Asia and the Malay Archipelago. See Pitta; and for illustration, Lyre Bird, etc.

AN-TUNG. A town in southeastern Manchuria, on the Yalu, about seven miles from its entrance into the Bay of Korea. It is the seat of a United States consul. It was the headquarters of General Kuroki during the battle of the Yalu in the Russo-Japanese War.

ANT'WERP (Fr. *Anvers*). A province of Belgium south of the Netherlands, with an area of 1093 square miles (Map: Belgium, C 3). The soil is fertile and yields large quantities of grain. Cattle and other domestic animals are also raised. The chief manufactures of the province are laces, sugar, wool, cotton fabrics, and liquors. Capital, Antwerp. Population, in 1900, 819,159.

ANTWERP (Fr. *Anvers*, anciently *Andoverpum*, from *Anc de Werp*, "at the wharf, harbor"). A city of Belgium, capital of the province of the same name, situated on the right bank of the Scheldt, in lat. 50° 13′ N., long. 4° 23′ E. (Map: Belgium, C 3). It ranks first in commercial importance and second in population among the cities of Belgium, and its harbor is considered one of the best in Europe. Antwerp is situated in a fruitful and well-cultivated region. The larger part of the city lies within the walls, which have been continually extended and improved, and at present have a total length of eight miles. In point of architectural beauty and artistic achievements, Antwerp has but few rivals among European cities.

The most noteworthy edifice is the Cathedral of Notre Dame, the noblest and largest specimen of Gothic architecture in the Netherlands, covering an area of 70,060 square feet. It was begun in 1352 and continued at various periods during the fifteenth and sixteenth centuries. The roof is supported by 125 pillars, and the lofty tower, whose exquisite beauty Charles V. was wont to compare to Mechlin lace, is a marvel of gracefulness. The highly ornamented portal and the fine tracery of the window above it are particularly worth seeing. The impressive interior, the unusual seven-aisled division of which is to be noted, contains three celebrated works by Rubens, "The Descent from the Cross," "The Elevation of the Cross," and adorning the high altar in the choir, "The Assumption;" the first-named being the most magnificent, and generally considered his masterpiece. The church of St. Jacques, begun in the late Gothic style, in 1491, and completed in 1656, outranks the cathedral in the splendor of its decorations and monuments. Among the many altars, private chapels, and burial vaults, belonging to the most distinguished families of Antwerp, that of the Rubens family is the most interesting. Of the secular buildings, the Hôtel de Ville, in the Grande Place, a fine structure in the Renaissance style, dating from 1561-65, and rising to a height of 180 feet, and the Bourse, a stately edifice in the late Gothic style, deserve especial attention. The museum, erected in 1879-90, from plans by Winders and Van Dyck, is an imposing rectangular structure, inclosing six inner courts. Its picture gallery boasts of an unusually fine collection of paintings by the old masters, including about 800 canvases, especially of the Flemish school, among which are rare specimens by Jan van Eyck, Memling, Massys, Rubens, Van Dyck, etc.; "The Entombment of Christ," the masterpiece of Quinten Massys, and the "Christ Crucified," by Rubens, a work of great dramatic effect, being the most remarkable. Worthy of mention are also the Musée Plantin-Moretus, famous for its collection of everything pertaining to the early history of printing, the Guild Hall of the Archers, the Vieille Boucherie or old meat market, and the Steen, part of the old castle dating from the Tenth Century, once the seat of the Inquisition, and now containing an archæological museum.

Antwerp is administered by a burgomaster, assisted by five assessors and a municipal council. The burgomaster is nominated by the King for a period of eight years. The assessors are chosen by the municipal council for the same period. The municipal council numbers 39 members, including 8 members from the labor council, who are elected by all voting citizens for 8 years. The city is divided into 9 districts, administered by commissioners. Water is supplied by private companies. With the exception of the railway stations and the harbor, which have electric lights, the city is lighted by gas. Of its annual budget of over $7,500,000, the city expends about 15 per cent. on the service of the debt, which amounts to about $60,000,000 at 2½ per cent., repayable by 1977.

Educational Institutions. The most noteworthy are the commercial school, established in 1852, the Athénée Royal, the Academy of Fine Arts, dating from 1665, and attended by over 160 students, and the Royal Conservatory of Music, with an attendance of about 1350. Some of the higher schools are managed by Jesuits, and the German School is supported by the German Government. Besides numerous scientific associations, Antwerp has many societies for the advancement of art, and its triennial exhibition of paintings is regarded as an important event in the world of art. The city has two theatres and two municipal libraries. Of the 16 daily newspapers published in Antwerp 6 are in French and 10 in Flemish. Besides two hospitals with 900 beds, an insane asylum, and asylums for orphans and aged people, there are a considerable number of minor charitable institutions maintained by private societies. The industrial establishments of Antwerp include distilleries and breweries, textile mills, diamond-cutting works, sugar refineries, cigar factories, etc. Antwerp is inferior to few European cities in the volume of its commerce, and is considered one of the greatest centres of the grain import trade. Its commerce is chiefly with the Balkan countries, Russia, the United States, and South America. The total annual value of the commerce, of which a large portion is transit, exceeds $1,200,000,000. Antwerp has magnificent harbor advantages. The quays have a total length of 3½ miles and are provided with gigantic cranes for the loading and unloading of vessels. There are eight large basins and a number of smaller ones connected by sluices with the Scheldt. Plans for enlarging the port were decided upon in 1905. Its area will be tripled, giving it 37.3 miles of running quays, a canal will be constructed five miles long and 815 feet wide, and also an artificial channel for the Scheldt, the sand banks of which are rather dangerous to navigation. The cost of the work is estimated at 250,000,000 francs ($48,250,000), and its completion will take no less than ten years. In 1899, 5613 vessels representing a tonnage of 6,872,848 cleared the port. In 1905 6034 ships, with 9,851,000 tons, entered it. Antwerp is the chief arsenal of Belgium and is fortified by strong ramparts and numerous citadels and forts, which the Government contemplates to extend so as to include a circumference of nearly eighty miles. It has also devices for the flooding of the surrounding country and contains a garrison of about 10,000 men. The population is (1905) 297,311, not including the suburbs, with a population of over 50,000. In 1830 the total population was only 73,500, while in 1891 it numbered 232,732. The average annual temperature of the city is about 50°, or nearly the same as that of New York.

Antwerp appears in history as early as the Seventh Century, is spoken of as a market town some hundred years later, and by the middle of the twelfth century seems to have attained considerable prosperity as a trading town. Steadily extending its commercial operations under the rule of the Dukes of Burgundy, it became in the second half of the Fifteenth Century the world-mart of Europe, supplanting the other great Flemish cities, Bruges and Ghent. It was the *entrepôt* for the trade between England and the Continent, and in its harbor vessels from the north and the south of Europe met to exchange their cargoes. In the first half of the Sixteenth Century, under the rule of Charles V., the city was at the height of its splendor and prosperity. It was the principal station of the Hanseatic League and the centre of the money exchanges of Europe, while its manufacturing industry was on a level with its vast shipping. Material prosperity was accompanied by intellectual progress, and the great schools of Flemish painters made Antwerp their principal home. The events of the Reformation brought about a sudden decline. The reign of terror instituted by the Duke of Alva, and the siege of 14 months by the Duke of Parma (1584-85), to whom the city offered a heroic but ineffectual resistance, sapped the prosperity of Antwerp. Its population at the end of the Sixteenth Century had dwindled to 55,000, or less than half of what it had been at the beginning of the century. Its ruin was completed by the Treaty of Westphalia, which closed the navigation of the Scheldt. It received new life from the French, who took the city in 1794, and declared the Scheldt open once more. Later Napoleon attempted to set it up as a rival to London. During the Belgian Revolution of 1830, the Dutch general Chassé held the citadel for two years against the citizens, until he was forced to surrender by a French army under Gérard. After the revolution, the growth of the city was rapid. Consult: J. P. Van Mol, *Guide to Antwerp* (Antwerp, 1886); E. Rowland, "Le Port d'Anvers," in *L'Economiste Français*, Vol. II. (Paris, 1899); "The Great Fire at Antwerp, and its Effects," in *The Builder*, Vol. LXXX. (London, 1901).

ANTYL'LUS (Gk. Ἄντυλλος, *Antyllos*). A Greek physician and surgeon who is supposed to have lived in the Third or Fourth Century, A.D. He is said to have been a voluminous writer, but only the fragments of his works quoted by Oribasius are extant. Of these extracts, the most interesting describe his method of operating on aneurisms. Antyllus is the earliest writer whose directions for performing tracheotomy are extant.

ANU′BIS (Gk. *Ἅνουβις*, *Anoubis*, hieroglyphic *Anúpu*). An Egyptian deity. His original seat of worship is not known with certainty, but there is some reason to believe that it was near Memphis. As his sacred animal, the jackal, haunts the desert valleys used as burial places, Anubis became the god of the necropolis, and was supposed to conduct the souls of the dead down to the lower world, Amenthes, like the Greek Hermes Psychopompos. Hence the late Greek combination Hermanubis. Anubis was also the assistant of Osiris at the final judgment, and weighed in the scales the heart of the deceased against the feather, symbolic of truth and right. As the balance was found level or the reverse the fate of the deceased was determined. When a more elaborate mythological system was formed, Anubis was made the son of Osiris by his sister Nephthys. The god is usually represented in human form, with the head of a jackal, which the Greeks changed into that of a dog and called the cities sacred to Anubis, Kynospolis (Dog City). Of these cities, the best known is that in Middle Egypt. In Roman times, when the Egyptian worship had spread to Italy, Hermes, who was identified with Anubis, sometimes had the dog's head among his insignia. For illustration see EGYPT.

ANU′KIS (Egyptian *A nûqet*). An Egyptian goddess worshiped in the district around the first cataract of the Nile. She usually accompanies the god Chnum and is represented in human form, with a red crown of feathers on her head. For some reason now unknown she was identified by the Greeks with Hestia (Latin Vesta). For illustration see EGYPT.

ANU′RA (Gk. *ἀν*, *an*, priv. + *οὐρά*, *oura*, tail), or SALIENTIA (Lat., from *salire*, to hop, jump). An order of Amphibia including those that have no tail when adult. It is subdivided by Cope into three sub-orders: *Aglossa*, African and tropical American (Pipa) toads, and fossil forms; *Firmisternia*, frogs; *Arcifera*, toads.

A′NUS (Lat.). The external termination of the rectum. The anus is kept firmly closed by the *external* and *internal sphincter* muscles, the former of which contracts the integument around the opening, and, by its attachment to the coccyx behind and to a tendinous centre in front, helps the *levator ani* muscle in supporting the aperture during the expulsive efforts that are made in the passage of the fæces or intestinal evacuations; while the latter, or *internal sphincter*, is an aggregation of the circular muscular fibres of the lowest part of the rectum, and acts in contracting the extremity of the tube. The main function of the *levator-ani* muscle is expressed in its name. It supports the rectum and pelvic structures, and during the act of defecation lifts the lower end of the gut up from the mass of extruded fæces. The integument around the anus lies in radiating folds, which allow of its stretching without pain during the passage of the fæces; and the margin is provided with a number of sebaceous glands, which, in some of the lower animals, secrete strongly odorous matters. (See SCENT GLANDS.) Infants are occasionally born with an imperforate anus, or congenital closure of the rectum. In the simplest form of this affection, the anus is merely closed by thin skin, which soon becomes distended with the meconium (q.v.). More complicated cases are those (1) in which the gut terminates some distance above the seat of the anus in a blind sac or pouch, (2) where the rectum terminates in the bladder, etc. Fortunately, the closure by a layer of skin is far the most common form of imperforate anus, and the condition is readily relieved by a simple surgical operation. The complicated cases require opening of the abdominal cavity and the insertion of an artificial anus through the lower part of the abdominal wall. If the condition of imperforate anus is neglected, the child dies in a few days as a result of intestinal obstruction.

Spasm of the sphincter ani is by no means a rare affection; it is characterized by violent pain of the anus, with difficulty in passing the fæces. On attempting an examination, the muscle feels hard, and resists the introduction of the finger. It usually occurs in sudden paroxysms, which soon subside, but sometimes it is of a more persistent character. Spasm of the sphincter may be regarded as a symptom of fissure, ulcer, or some other form of anal or rectal irritation. Suppositories containing opium or belladonna, introduced during the period of relaxation, are sometimes of use, and if there are ulcers or fissures they must be specially treated. *Ulceration* occurring as a breach of surface at one or more points around the anus, but not extending within the orifice, is by no means uncommon in persons who are not attentive to cleanliness, and especially in women with vaginal discharges. The treatment consists in strict attention to cleanliness, and perhaps one or two applications of the silver nitrate stick or of pure carbolic acid. If the ulcer is seated partly *without* the anus and partly *within* the rectum, the distress is much more severe, and the treatment often requires excision, where local applications have failed to give relief. *Fissure of the anus* is a term applied to an affection consisting in one or more cracks, excoriations, or superficial ulcerations, situated between the folds of the skin and mucous membrane at the verge of the anus, and only slightly involving the rectum. They give rise to intense pain during the passage of the evacuations, and for some hours afterward to great discomfort, smarting, and itching. The treatment to be adopted is to endeavor to procure regular and somewhat soft evacuations, and to sponge with warm water immediately afterward, the parts being dried with a soft cloth. One or two applications of solid nitrate of silver will sometimes cure the disease, and an ointment of oxide of zinc, or one containing cocaine, will sometimes serve to allay the irritation and heal the parts. If these measures do not afford relief, the sphincter muscle must be dilated, the base of the fissure incised, and its surface scraped with a sharp spoon. *Pruritus ani*, which simply means intense itching and irritation of this part, is to be regarded as a symptom of certain morbid changes rather than as a special disorder; but as it is a very common affection, and is productive of much suffering, it must not be passed over. It is often associated with an unhealthy state of the intestinal secretions, or with simple constipation; with a congested state of the mucous membrane; with uterine and ovarian diseases; kidney disease; diabetes; neurasthenia; tea, alcohol, tobacco, and opium habits; the presence of thread-worms in the rectum; eczema, etc.; and it is peculiarly common in persons whose occupations are sedentary. The affection is often much aggravated by the patient's being unable to refrain from scratching the parts, which tends to excoriations, ulcerations, thickening of the skin, etc. The symptoms are usually most severe when the sufferer begins to get warm in bed. The treatment in every case must aim to remove the cause, whether general or local. If the affection arise from worms, or a loaded state of the large intestines, enemata and purgatives will give immediate relief. If unhealthy excretions exist, attention must be paid to the diet, the bowels must be kept freely open, and strict local cleanliness observed. If there are any cracks or ulcers, nitrate of silver must be applied until they heal. In all cases of pruritis which have persisted for any length of time, the skin is found thickened and the redundant layers of epidermis must be removed and kept from reaccumulating by the repeated applications of ointments containing such substances as carbolic acid, calomel, and corrosive sublimate. The other principal affections of the anus are *fistula*, *piles*, and *prolapsus*, which are discussed in special articles.

AN'VARI. A Persian poet famed for his panegyrics and for his verse in satiric vein. His full name was Auad-uddin Ali Anvari. He was born in the first part of the Twelfth Century, in the province of Khorassan. He first wrote under the title of Khavaran, from his native district; but he afterward adopted Anvari as his poetic epithet, and by this he is known to fame. He was educated at the collegiate institute at Tus (see FIRDAUSI) and he devoted his attention especially to astronomy; but finding more opportunity for preferment at court in literature, he composed a panegyric in honor of Sanjar, the ruler of Khorassan. This by its artistic grace immediately won him the royal favor, and he continued to enjoy the patronage of Sanjar's two successors as well. But Anvari's latter days were attended by ill luck. Employing his astronomical knowledge, he prophesied that a certain conjunction of the stars in October, 1185, would be accompanied by a frightful storm and dire disasters. The utter failure of the evil portents which were predicted drove him practically into banishment, and he withdrew to Nishapur, and later retired to Balkh, where he died about 1190. Anvari's verses, as shown by his *Divan*, or poetical collection, are masterpieces of artistic form. With the consummate skill of a romantic panegyrist he combined, in high degree, the subtle force of a keen satirist of the foibles and follies of his time. There is a lithographed edition of the *Divan* (Lucknow, 1880). For details consult Ethé, in the *Grundriss der iranischen Philologie*, Vol. II. (Strassburg, 1896-1904).

AN'VIL (ME. *anvelt*, AS. *anfilte*, of uncertain origin). An iron or steel block, with a smooth, flat face or top, on which malleable metals are hammered and shaped. Anvils vary in size from the tiny articles used by jewelers to the enormous anvil blocks of power hammers, which weigh several tons. (See HAMMERS.) Blacksmiths' anvils have a cone or horn at one end of the flat face and a socket for a chisel in the other end. They are commonly made of cast iron faced with steel, the steel face being placed at the bottom of the mold and the iron poured upon it.

ANVILLE, äɴ'vēl', JEAN BAPTISTE BOURGUIGNON D' (1697-1782). A French geographer, who raised that branch of knowledge to the rank of a science. He was born at Paris and devoted himself to geographical and mathematical studies with such success that at the age of twenty-two he became royal geographer. He read the Greek and Latin historians and philosophers, as well as poets, noting the names and positions of cities and nations. He advanced the science of geography, not only by the number of maps (211) which he published, but also by publication of 78 memoirs full of erudition and of historic and critical details. Most of these are included in the *Recueil des mémoires de l'Académie des Inscriptions et Belles-lettres.* His great map of Africa was the most complete yet published. Among the most important of his works are: *Atlas général* (1737-80); *Atlas Antiquus Major*, with the *Géographie ancienne abrégée* (3 vols., 1769).

ANZENGRUBER, än'tsen-grōō'bẽr, LUDWIG (1839-89). An Austrian dramatist and novelist, born at Vienna. He left school early, and after spending some years in business pursuits became a strolling actor at the age of nineteen. While leading this life (1860-67), he wrote a number of plays, none of which met with success, then turned to journalism, and finally accepted a clerical position in the police department of his native city. While thus employed he produced, in 1870, his "Pfarrer von Kirchfeld," an anticlerical drama, which caused a sensation and made him famous. He now decided to devote himself exclusively to literature. In the following year was performed the "Meineidbauer," a powerful drama of peasant-life, by many considered his masterpiece. Even more popular proved the "Kreuzelschreiber" (1872), whose subject is less sombre. All these plays were performed in the popular Theater an der Wien. A drama written for the more exacting audiences of the Burgtheater was unsuccessful, but when Anzengruber returned to the scenes and characters of the peasant-life he knew so well, he achieved uniform success, as with his "Gwissenswurm" (1874), and many other plays. He showed the same power of character-drawing in his novels *Der Schandfleck* (1876), and *Der Sternsteinhof* (1883-84). His pathos and humor are equally genuine. Although many of the characters in his plays and novels speak the dialect of Upper Austria and Styria, his works have won a conspicuous place in German literature, and several of his plays hold the German stage, at the present day. His collected works appeared in 1896-99. See the biography, by Bettelheim (Dresden, 1891), and Rosner, *Erinnerungen an Anzengruber* (Leipzig, 1891).

ANZIN, äɴ'zăɴ'. A town in the Department of Nord, France, on the Scheldt, near Valenciennes, in the centre of a most productive coal-mining district (Map: France, K 1). Anzin has iron foundries, glass-works, breweries, sugar refineries and distilleries. Pop. 1901, 14,444.

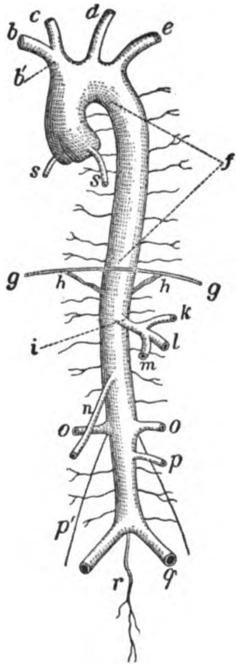
ANZIO, än'zē-ō, formerly PORTO D'ANZIO. A Mediterranean seaport in the Province of Rome, Italy, 33 miles southeast of Rome by rail. It has fishing industries and, with Nettuno (population 1900), 1½ miles eastward, is a favorite bathing resort of the Romans. It occupies the site of Antium (q.v.). The modern town dates from the restoration of the harbor in 1698, by Pope Innocent XII. There are several palatial villas in the suburbs. Population, in 1901, 3561. Consult Sofredini, *Storia di Anzio* (Rome, 1879).

AOKI, SIUZO (1844—). A Japanese statesman, born in Choshiu. He was appointed secretary of the Japanese legation at Berlin, in 1873, and afterward minister there. In 1886-89 he was vice-minister of foreign affairs, in 1889-91, and in 1898-1900 minister of foreign affairs. He became ambassador to the United States in 1906.

AOMORI, ä'ô-mō̆'rê, or **AWOMORI,** ä'wô-mō̆'rê. A town of Japan, capital of the prefecture of the same name, situated at the northern end of Honshiu, on the Aomori Bay (Map: Japan, G 3). Pop., **1903, 34,857.**

AO'NIA (Gk. *Αονία*). A district of Bœotia in ancient Greece. The Muses, as dwelling on Mount Helicon, in Aonia, were called *Aonides*.

A'ORIST (Gk. *ἀόριστος*, *aoristos*, without boundaries, indefinite, from *ἀ*, *a*, priv. + *ὁρίζειν*, *horizein*, to divide, to bound). A form of the Greek verb by which an action is expressed as taking place in an indefinite past time. In distinction from the imperfect, the aorist expresses only the occurrence of an action or the entrance into a state or condition, while the imperfect represents an action or state as going on or repeated in past time.



AORTA

A, ascending arch of aorta; *ss*. coronary arteries; *b'*, innominata artery; b, right subclavian; *c*, right carotid; *d*, left carotid; *e*, left subclavian; *f*, thoracic aorta; *gg*, diaphragm; *hh*, phrenic arteries; *i*, cœliac axis; *k*, coronary or gastric; *t*, splenic; *m*, hepatic; *n*, superior mesenteric; *oo*, renal arteries; *p*, spermatic; *q*, common iliac; *r*, middle sacral.

AOR'TA (Gk. *ἀορτή*, *aortē*, from *ἀείρειν*, *aeirein*, to lift, raise). The great arterial trunk which, rising from the left ventricle of the heart, sends its branches ramifying through the whole body. The aorta in man is subdivided by anatomists into the arch, the thoracic aorta, and the abdominal aorta. The *arch* is a loop with the convexity directed upward, forward, and to the right side, reaching at its highest part to a level with the second piece of the breast-bone, and then descending to the left side of the fourth dorsal vertebra. Five arteries arise from the arch—viz., two coronaries, for the supply of the muscular tissue of the heart itself; the innominate, and the left carotid and left subclavian arteries. At the commencement of the arch are three small swellings or pouches, the aortic sinuses, below which are the three semilunar valves or folds of the lining membrane, which prevent regurgitation of the blood into the heart. The *thoracic aorta* extends from the fourth dorsal vertebra to the diaphragm, gradually occupying the mid line of the spine. The thoracic aorta gives off the bronchial arteries (two or three) to supply the tissue of the lungs; and some small branches (three or four) to the œsophagus, and intercostal arteries, to supply the walls of the chest (ten on left, and nine on right side). The *abdominal aorta* passes from the diaphragm to the fourth lumbar vertebra, opposite the lower margin of which it divides into the two common iliac trunks. The abdominal aorta gives off the two phrenic arteries to the diaphragm; the cœliac axis, which divides into three large branches for the stomach, liver, and spleen; the superior mesenteric for the small, and part of the large intestine; the *renals* (two); the *suprarenals* (two), one for each kidney; the spermatic; the inferior mesenteric, for the part of the large intestine not supplied by the superior mesenteric; and four or five lumbar arteries, which supply the lower part of the abdominal walls (the loins). Where the aorta bifurcates, a small artery, the sacramedia, or caudal artery, arises, and passes along in the mid line; in fish and in animals with large tails, this branch is a continuation of the aorta.

The above is the usual arrangement; but occasionally it varies, especially in the number of arteries springing from the arch. The aorta has the same coats as one of the large arteries—consisting of an inner coat, the intima, a middle coat, the media, and an outer coat, the adventitia. The aorta differs from an ordinary artery in the absence of a distinct elastic membrane limiting the intima, and in the very large amount of elastic tissue intermingled with the smooth muscle of the media. (See ARTERY; CIRCULATION.) During fœtal life, there is a communication between the arch of the aorta and the pulmonary artery called the *ductus arteriosus*, the canal of which becomes obliterated after birth. The velocity of the blood current in the carotid artery has been estimated at 300 to 500 millimetres per second. In the aorta the velocity must be considerably greater. The pressure of the blood in the aorta of a dog has been found to be 121 millimetres of mercury. In man the pressure must be at least as great. For diseases to which the aorta is subject, see ARTERY and ARTERIO-SCLEROSIS.

AOSTA, ä-ōs'tȧ (anciently Lat. *Augusta*). A town in northern Italy, on the left bank of the Dora Baltea, 49 miles northwest of Turin (Map: Italy, B 2). Originally the capital of the ancient Salassi, it was converted into a Roman colony by Augustus, as a punishment for the depredations of its former inhabitants. Monuments of the ancient city are a well-preserved arch, two gateways, the ruins of an amphitheatre, and a bridge. The cathedral was built in the Sixth Century, and rebuilt in the Fourteenth. Also worthy of notice are the column commemorating the flight of Calvin from Aosta in 1541, the ruins of Bramafame Castle, in which the Count of Challant, through jealousy, starved his wife to death, and the Leper's Tower, immortalized by Xavier de Maistre. The chief trade is in leather, cheese, and wine. The province is rich in iron, copper, and lead, and in mineral springs, of which the most famous are those of Courmayeur, Pré-Saint-Didier, and Saint Vincent. Population, in 1881, 7437; in 1901, 7875.

AOSTA, Duke of. A title of the House of Savoy, borne by Amadeus, a former King of Spain, and now by his son, Emmanuel Filibert.

AOUDAD, ä'o͞o-dăd (Moorish name). The wild sheep of the mountains of northern Africa (*Ovis tragelaphus*). It is somewhat goatlike in form, three feet in height, and light brown in color, with very long whitish hair growing from the throat, chest, and about the forelegs. Its horns resemble those of the bharal, and do not exceed twenty-four inches in length. This animal is common in the high Atlas ranges, where it wanders over the more precipitous regions of their arid southern slopes from the Atlantic to Tunis, keeping within sight of the Desert, and hiding among the fantastically decomposed and bushy rocks of those limestone mountains, with singular skill. The animal has many names. In menageries, where it breeds and lives well, it is often labeled "ruffed mouflon" or "bearded argali"; the Moors of Algeria call it "aoudad," but the natives there know it as "arùi"; it is the "kebsh" of the Egyptians, and the "tidal" or "teybel" or "beden" of Nubia. See plate of Wild Goats, etc. For habits and methods of chase, consult: E. N. Buxton, *Proceedings Zoölogical Society of London* (1890); and id., *Short Talks* (London, 1898).

APACHE, å-pä'chå. An important and warlike Indian tribe of Athapascan stock, formerly roving in small bands over an extensive territory in southeastern Arizona and southwestern New Mexico, and extending their forays far down into Mexico. The name by which they are commonly known is from the Pima language, and signifies 'enemies.' Although essentially predatory in habit and carrying on constant raids against the Mexican settlements, they remained on friendly terms with the Americans until provoked by outrages about the time of the annexation of their country by the United States, after which their condition was one of chronic hostility toward the citizens of both Governments until finally subdued and confined to their present reservation at San Carlos, Ariz. Upon the surrender of the last hostile band, the Chiricahuas, in 1886, such energetic protest against their continued presence in the Territory was made by the people of Arizona, that the whole Chiricahua band was deported to the East, and after some years of military confinement in Florida and Alabama, was settled at Fort Sill, Okla., on the Kiowa Reservation. In 1900 the Apache tribe, including 300 Chiricahuas at Fort Sill, numbered 5200 souls. The Jicarillas and Mescaleros of New Mexico, and the Lipans, formerly of Mexico, although frequently spoken of as Apaches on account of their linguistic affinity, are in reality distinct tribes, and hostile to the Apaches proper.

APACHE TIM'OTHY. See Canary Grass.

APAFI, ŏ'pŏ-fĭ, or **ABAFI**, ŏ'bŏ-fĭ, Michael I. (1632-90), Prince of Transylvania. He accompanied Prince George II. in an expedition against the Poles in 1656, was taken prisoner by the Tartars, and after his release returned to his estate. In 1661 he was chosen Prince of Transylvania, through the support of Ali Pasha, generalissimo of the Turkish forces under Sultan Mohammed IV. During the peace concluded with Austria after the battle of Saint Gothard (1664), he reigned peaceably under the protection of the Porte. He remained faithful to the Ottoman power till after the siege of Vienna in 1683. Fortune then changed. The Imperial troops invaded the country; and in August, 1687, Apafi made a treaty with the Emperor by which Transylvania was declared to be freed from Turkish suzerainty, and placed under Austrian protection. At Fogaras the Transylvanian deputies, assembled at the National Diet, took the oath of fealty to the Hapsburgs as legitimate monarchs of Hungary. Ever since the death of his wife, Anna Bornemitza, in 1688, Apafi had been sorely afflicted both in body and mind, and died (April 15, 1690) on the eve of a fierce retributive war, commenced by his old allies, the Turks, who considered themselves ill-used by his desertion of them. His son, Michael II. (died 1713), succeeded to the throne and its perils. The Turks, under the vizier Kiuprili, overthrew the Imperial army, but the internal troubles of the Ottoman Empire hindered them, or rather Count Tökölyi (q.v.), whom they were supporting, from reaping the fruits of their successes. The Imperial troops subsequently regained everything. By the Treaty of Carlowitz, 1699, Transylvania was incorporated with Hungary, and the young Transylvanian prince was inveigled to Vienna, and cajoled into giving up his dominions to Austria in lieu of a pension of some 15,000 florins.

APALACHEE, ă'på-lä'chė, or **APALACHI**, ă'på-lä'chĭ. A tribe of Muskhogean stock formerly occupying the country about Apalachee Bay, northwestern Florida. About the close of the sixteenth century Spanish Franciscan priests established missions among them, which continued in a prosperous condition for more than a hundred years, until invaded in 1702-8 by the English from Carolina, accompanied by a large force of Indian auxiliaries. In three several expeditions the mission churches were burned, the missionaries slain, and the Apalachee tribe practically wiped out of existence, more than one thousand prisoners being brought back to be sold as slaves in Carolina or distributed by the English among their savage allies. A large number were thus incorporated among the Creeks, where for a time they preserved their name and language, but are now extinct.

AP'ALACH'EE BAY. An arm of the Gulf of Mexico near the northwestern part of Florida, extending about 50 miles inland (Map: Florida, D 1). It receives the waters of Saint Mark's River, at the mouth of which stands the town of the same name. Its average depth is 18 feet, and it affords a good harbor for small craft.

APALACHICOLA, ă'på-lăch-ĭ-kō'lå. A city, port of entry, and county seat of Franklin Co., Fla., eighty-five miles southwest of Tallahassee, on Saint George Sound (Gulf of Mexico) at the mouth of the Apalachicola River (Map: Florida, C 2). The value of its foreign commerce amounted in 1901 to about $370,000, a very large proportion of which was in the export trade, the principal commodities being lumber and naval stores. Pop. 1890, 2727; 1900, 3077.

APALACHICOLA. A river formed by the junction of the Chattahoochee with the Flint, at the southwestern corner of the State of Georgia. Thence flowing southward through Florida, it empties into Apalachicola Bay, an arm of the Gulf of Mexico. It is navigable for steamboats through its entire course of 90 miles.

APALIT, ä′pȧ-lēt′. A town of Luzon, Philippines, in the province of Pampanga (Map: Luzon, E 7). It is situated about eleven miles southeast of Bacolor, and has a population, 1903, of 12,206.

AP′ANAGE or **AP′PANAGE** (Fr., provision for maintenance, from Latin *ad panem*, for bread). The name applied in feudal law to contributions from the exchequer granted for the maintenance of princes of the royal house, or to lands and the revenues of lands set apart for the same purpose. Territorial apanages were bestowed either for life or upon a man and his direct heirs forever. Apanages were customary all over mediæval Europe, and especially in France, until the gradual development of the centralized monarchies, to the aggrandizement of which they were at all times a powerful hindrance. Louis XI., the real creator of the French monarchy, reunited the great apanages of the realm to the crown, but in a modified form. The institution continued until 1790, when it was abolished by the Constituent Assembly. In England the Duchy of Cornwall is in form an apanage of the Prince of Wales; but other members of the royal family in Great Britain, as well as in the continental monarchies, are now provided for by annual grants from the Civil List.

APAR, ä′pär. See ARMADILLO.

APAREJO, ä′pȧ-rā′ʜō (Sp., pack saddle). A leather bag about two feet wide, nearly encircling the mule or horse on which it is placed. The aparejo is used in the United States Army as a substitute for the pack saddle (q.v.). Two round hand holes are placed in the middle of each side, the sides of the bag being distended by small ash or other elastic wooden sticks. The advantages claimed are that it places the load to greater advantage than any other system of pack-transport, and secures better results from the animal.

APARRI, ȧ-pär′rē. A town of Luzon, Philippines, in the province of Cagayan. It is situated near the northeastern coast, at the estuary of the river Cagayan, and has a telegraph station. Pop., 1903, 18,252.

APARTMENT HOUSE. A building arranged in three or more suites of connecting rooms, each suite designed for independent housekeeping, but with certain mechanical conveniences, as heat, light, or elevator-service, furnished in common to all the families occupying the building. Legally, there is no distinction, in the United States, between an apartment house and any other tenement. Popularly, the apartment differs from the tenement in the greater elegance of architectural finish, in the larger number of conveniences, and in the greater complexity of mechanical service furnished to all tenants from a central plant. Midway, in popular usage, between the tenement house on the one hand, which is the home of the poor, and the apartment house on the other, whose annual rentals place it beyond the means of those with moderate incomes, stands the *flat*, which, like the cottage of the suburb, is designed for people of moderate means. The distinction, however, between a flat and an apartment, is not well defined, and the term apartment is often applied to any well-appointed flat. In the article on "Apartments" in the *Dictionary of Architecture and Building* (New York, 1902), the term is limited to those suites of rooms for independent housekeeping which rent for more than $300 per annum.

The typical flat or less expensive apartment, in New York City consists of a parlor, two or more bedrooms, besides the servant's bedroom, a dining-room, bathroom, and kitchen. These rooms either open directly into each other or are connected by a private hall. Ordinarily, they are arranged one behind the other, according to the rectangular shape of the ordinary city lot, and are reached by a common stairway, and often by an elevator. The provisions are brought up by a dumb-waiter or freight elevator. Light and air for the interior rooms are obtained by means of interior courts or air shafts. Of course, this general plan is subject to many modifications, depending on the size and shape of the house and the number of flats on a floor. Flats are usually heated by steam or hot air and lighted by gas or electricity. Hot water is frequently supplied. In apartments the rooms are susceptible of much greater flexibility in arrangement than in flats, as such buildings are usually built over several lots, and frequently cover an entire block. The number of services furnished by a central plant to all the tenants is also greatly increased. An *apartment hotel* differs from an apartment house in that only living rooms are provided for the different families, who eat in a common dining-room, as do the guests of an ordinary hotel. In some of the newer and more elaborate apartment houses of New York there is a restaurant in the building, where families may eat meals or not, as they choose, there being a separate dining-room and kitchen in each apartment as well.

HISTORICAL DEVELOPMENT. Apartment houses have been in vogue in the large cities of Continental Europe for some centuries, and, in Paris particularly, they have been developed to a high degree of elegance and luxury. In Great Britain, apartment houses have never become popular. In the United States, their development began with the rush to the cities which followed the Civil War. The chief causes which have led to their rapidly increasing popularity are: (1) The great congestion of population within a limited area in our large cities, which makes separate houses more and more impracticable; (2) the advantage of enjoying such common services as elevator, heat, artificial light, and hot water independent of the kitchen range, which can be furnished a group of families in a single building at much less cost than if those families were separated in isolated homes; (3) the migratory tendency among city dwellers which makes them prefer the easily vacated apartment to the more permanent house; and (4) the smaller amount of domestic service required in an apartment, which, in these days of high-priced and unsatisfactory servants, is perhaps the most important consideration of all.

During the past few years, large numbers of apartment houses of the highest grade have been built in all large American cities, and have become popular among the most wealthy and luxurious classes of the people. A description of a single one of these highly developed modern structures will give an idea of the whole class.

The following account of an apartment house built in 1899, on upper Broadway, New York, is based on a description contained in the *Engineering Record* for January 20, 1900: Apartments in this building rent at from $2500 to $3000 annually. The building itself covers an entire block, and is fireproof in its construction. The main entrance leads into a vestibule, beyond which is a large hall and general reception-room where hall boys are in attendance. At the rear of the hall are the elevators which lead to general halls on each floor. Each apartment consists of a parlor, library, dining-room, kitchen, butler's pantry, servant's room, bathroom, servant's bathroom, and a number of bedrooms. Gas-ranges are used for cooking, so that neither coal nor ashes are encountered. The built-in refrigerators are kept at the proper degree of coldness by means of a refrigerating plant in the basement, thus excluding ice, also, from the apartments. Hot as well as cold water is furnished. There is an arrangement in connection with the dining-room radiators for plate-warming, as the apartments are heated by steam. The house is furnished with both gas and electric-light fixtures. Electricity is generated in the building, and is furnished to the tenants free until midnight, after which they must depend for light upon gas at their own expense. Every apartment is provided with a telephone from a private branch exchange. Household provisions are distributed by a freight elevator, and there is a separate servants' stairway. The mechanical plant which furnishes steam, hot water, electricity, and refrigeration to the building is situated in the basement. Connected with it is an apparatus for drying clothes. This consists of a series of clothes dryers, heat being derived from a number of steam coil-pipes and the air being circulated by an exhaust-fan. In this and other high-class apartment houses an elaborate ventilating system is provided. In some of the most recent houses the sleeping-rooms for the servants are grouped together upon the top floor. Occasionally a barber shop within the building is added to the list of conveniences accessible to its occupants.

It is interesting to compare such an American dwelling as the one just described with a French apartment house of the same grade. In Paris, the height of buildings is limited by law to five stories, so that it is impossible for a single structure to accommodate the same number of families as in America, and hence the central mechanical plant must be less elaborate or, pro rata, more expensive. As a matter of fact, Parisians are only beginning to avail themselves of conveniences which American city dwellers have long considered essential. Hot air instead of steam heat is universal, a supply of hot water is seldom furnished, and only within a few years have adequate water-closets and other toilet facilities been enjoyed. The rooms of a Parisian apartment, however, are likely to be larger, and greater in number, than in an American apartment of the same grade. Prominent in the arrangement of every suite is the principal bedroom belonging to the mistress of the house, which is larger in comparison with the other rooms, and faces the street. Opening upon this bedroom is the boudoir or dressing-room. Beside the other bedrooms are the drawing-room or salon, the billiard-room, dining-room, and the butler's pantry, which separates the dining-room from the kitchen. The kitchen in proportions and importance ranks next to the principal bedroom. The contrast is striking between such a suite of rooms and an American apartment, for in the latter the bedrooms are relegated to the rear and, like the kitchen, are extremely small in comparison with the parlor, library, and dining-room. In Parisian apartments the servants' rooms are on the top floor, a separate staircase is provided for them, and they are otherwise isolated from the rest of the family, as in many of the newest American apartments. In general the suites of a French apartment house are grouped around a central court; each suite is composed of a double row of rooms, the parlor and main chambers situated on the street and the dining-room and subordinate rooms upon the court, a hall separating the two groups of rooms. Recently a second hall or gallery has been introduced in many apartments which connects parlor, dining-room, and chambers, and is decorated with pictures, sculpture, and other works of art.

For legal restrictions regarding the various sanitary arrangements of apartment houses, see article TENEMENT HOUSE PROBLEM. The literature concerning apartment houses is mainly confined to various articles in the technical magazines. For some of these articles see: Volumes 40, 41, and 42 of the *Engineering Record* (New York); Volume 7 of the *Architectural Record* (New York); *The Brick Builder* (New York), for June, 1898, and the *British Architect* (London), for February 3, 1889. See also Perks, *Residential Flats of All Classes* (New York, 1905).

APASTAMBA, ŭ'pȧ-stŭm'bȧ. An ancient Sanskrit author, noted in connection with Vedic literature because of the *Srauta-*, *Gṛhya-*, *Dharma-*, and *Kalpa-Sūtras*, which bear his name. See VEDA.

APATIN, ŏ'pŏ-tĭn. A town of the Kingdom of Hungary, in the county of Bács-Bodrog, situated on the left bank of the Danube, about forty-five miles southwest of Maria-Theresiopel (Map: Hungary, F 4). Its chief industry is the manufacture of rope made from the hemp raised in the vicinity. Population, 1900, 13,940 (mostly Germans).

AP'ATITE (from Gk. *ἀπάτη*, *apatē*, deceit, as the mineral has often been mistaken for other minerals). A mineral consisting of phosphate with some chloride and fluoride of calcium, its composition being represented by the formula $Ca_3(PO_4)_2 + Ca(CIF)_2$. It occurs both in crystalline and amorphous form, and is largely used in the manufacture of fertilizers, for which it is valuable on account of the contained phosphoric acid. It occurs in both stratified and crystalline (metamorphic and igneous) rocks, especially in the latter. It is thus found in the older crystalline rocks in Canada, New York, Maine, and New Jersey; in Europe, it is known in England, France, Saxony, Tyrol, Bohemia, Spain, Norway, etc.; but the only deposits of economic importance are those of Canada, Norway, and Spain. Most of the Canadian material that has been shipped contains eighty-five per cent. of the phosphate of lime. In recent years the enormous deposits of rock phosphate or amorphous phosphate of lime have seriously injured the Canadian trade. Amorphous phosphate is a name given to non-crystalline deposits of phosphate of lime occurring in more or less abundance at certain localities and of importance as a source of fertilizer. In the United States the most important deposits are in South Carolina, Florida, and Tennessee, but a small supply has also been obtained from Pennsylvania. The Florida deposits, which have been worked since 1888, are found near the western coast. They occur as lumps imbedded in clay, known as Rock Phosphate; in pebble agglomerations, known as Land Pebble; or as a mixture of small pebbles and sand in the river bottoms called River Pebble. The latter mixture is obtained by dredging, the sand being eventually separated by screening. The South Carolina deposits are found in an area about sixty miles long, between Charleston and Beaufort. The phosphate occurs in nodules buried in sand and clay, the productive bed being one to two feet thick. An acre yields four hundred to twelve hundred tons. The South Carolina district was opened up in 1867. Both the Florida and South Carolina deposits occur associated with rocks of Eocene and Miocene ages, and many teeth of sharks, elephants, etc., together with bones, are found with the phosphate. The phosphoric acid of the mineral is supposed to owe its origin to the accumulation of excrement and decaying animal matter deposited along the shores or in pools during Tertiary times, and to subsequent local replacement of limestone, or to concretionary segregation of phosphate of lime. In south central Tennessee, the phosphate is associated with Devonian rocks. The phosphate industry of the United States has assumed great importance in recent years, and much of the material is shipped to foreign countries. The recent development of large deposits known to exist in Algiers may cause serious competition with the American industry. Crude rock containing less than fifty per cent. of calcic phosphate is unsalable. Siliceous impurities are inert, but alumina and ferric oxide are bad, because they tend to change the refined phosphate back to an insoluble condition. Lime, if present, neutralizes some of the sulphuric acid used in the manufacture of the fertilizer. The price of phosphate varies from year to year, and with its grade. That from Tennessee may bring as little as $1.60 per ton, while the hard rock from Florida may bring as much as $5.00 per ton. The importance of Canada as a producer of phosphate has been greatly lowered by the development of the American beds. Those of Florida have assumed great predominance, for the ease with which the material can be mined, and by reason of their proximity to shipping points; the latter feature having been an important factor in the development of a large export trade.

For more particular information the reader is referred to the general paper by Adolphe Carnot: "Sur les variations observées dans la composition des apatites, * * * Remarques sur le gisement et le mode de formation de ces phosphates" in the *Annales des Mines*, Volume X. (Paris, 1896). Papers descriptive of the phosphate deposits of particular regions are: Branner, "The Phosphates of Arkansas," in the *Transactions of the American Institute of Mining Engineers*, Volume XXVI. (New York, 1896); Hayes, "The Tennessee Phosphates," in the *Sixteenth Annual Report of the United States Geological Survey*, Part IV. (Washington, 1895).

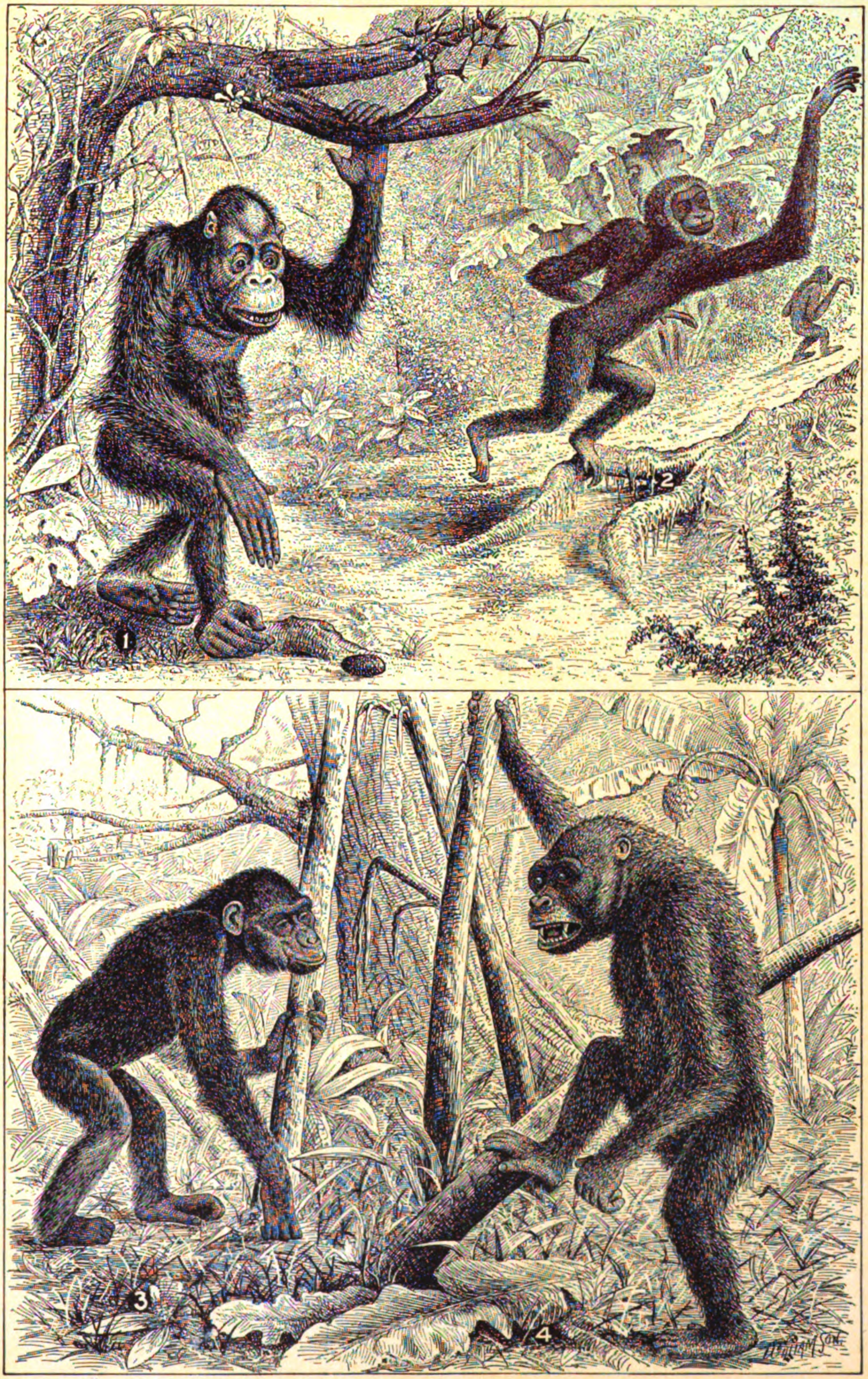
Bibliography. Brown, "The Phosphate Rock Deposits of Tennessee during 1897," *United States Geological Survey*, Nineteenth Annual Report, Part VI. (continued) (Washington, 1898); McCallie, "A Preliminary Report on a Part of the Phosphates and Marls of Georgia," *Georgia Geological Survey Bulletin*, No. 5-A (Atlanta, 1896); Eldridge, "A Preliminary Sketch of the Phosphates of Florida," *Transactions of the American Institute of Mining Engineers*, Volume XXI. (New York, 1891); Smith, "The Phosphates and Marls of Alabama," *Transactions of the American Institute of Mining Engineers*, Volume XXV. (New York, 1895); Penrose, "The Nature and Origin of Deposits of Phosphate of Lime," Bulletin No. 46, *United States Geological Survey;* Small, "The Phosphate Mines of Canada," *Transactions of the American Institute of Mining Engineers*, Volume XXI. (New York, 1891); and Wyatt, F., *The Phosphates of America* (New York, 1891).

APAYAO, ä̆'pȧ-yä̆'ō, or **APOYA**, ȧ-pō̆'yȧ. A head-hunting tribe in Cagayan Province, Luzon. Their speech is separate.

APE (AS. *apa*, Ger. *Affe*). A monkey; any quadrumanous animal, especially one of large size, and belonging to the Old World. (See below.) Thus, the "apes of Gibraltar," or "Barbary apes," are macaques (q.v.) and some "sacred apes" are baboons. (See Baboon; Macaque; Monkey, etc.) More particularly the word nowadays applies to simians (family Simiidæ), called "anthropoid apes," because they most resemble mankind.

The Anthropoid Apes consist of the chimpanzees, gorilla, and orang, the gibbons, together with several extinct and fossil species; but the three forms first mentioned are those usually in the mind of those who use the term in its popular sense. All approach, and some may exceed, man in size, frequently assume an erect attitude (though none are so much at ease in this position as are some gibbons), and resemble him in structure more closely than they do the apes and monkeys of other families. This is much more marked in young examples, however, than in the adults, which in advanced age become more and more brutish. This is particularly true of the characteristics of the skull, where huge, bony "crests" and super-orbital ridges develop, the canine teeth become greatly enlarged, and a revolting expression of face reveals the essentially savage and intractable nature of the animal, which, enforced by gigantic strength, renders these apes among the most formidable and ugly of wild beasts. The skeleton is substantially similar to the human skeleton, differing from it in greater size and weight, and in certain proportions; the arms also are relatively much longer, and the legs shorter, and the great toe is longer and opposable only to a very limited degree. The spine lacks those curvatures in its lower part which enable man to stand erect with ease. In the flatness of the sternum and the absence of a certain small bone in the wrist, these apes agree with man and differ from the monkeys. The skull is thicker, has in age great bony ridges, and projects at the muzzle; the teeth are of the same number and character as man's, but they are not set in a horseshoe

ANTHROPOID APES



1. ORANG-UTAN (Simia satyrus).
2. GIBBON (Hylobates leuciscus).
3. CHIMPANZEE (Anthropopithecus niger).
4. GORILLA (Gorilla savagei).

form, but more nearly on three sides of a square, the front teeth making a decided angle with the cheek teeth, where the canines are developed into great tusks. The brain-case is smaller, and the bulk of the brain far less than that of man. Thus, according to Mivart, a normal human brain never measures less than 55 cubic inches, while that of the chimpanzee (the nearest) measures only 27½ cubic inches; the cerebrum is also relatively shorter. In its general form and structure, however, the brain of these apes is like that of man, and is richly convoluted. There are no important differences in the soft parts of the body or their functions.

Externally, all the anthropoid apes are covered with black, brown, or reddish coarse hair, on all parts of the body except the face and palms, where the skin is dark, leathery, and wrinkled; the naked patches and callosities so frequently found upon the buttocks of the lower apes are absent or very small; nor are there any cheek-pouches. There is no trace of a tail. The chimpanzee and gorilla are closely related to one another, but the orang is as distinct in structure from them as it is widely removed in habitat. All are inhabitants of the equatorial regions of the Old World, and restricted to forests, where they live in the trees, building rude sleeping platforms and shelter, and feeding wholly upon vegetable food —chiefly fruits. See Chimpanzee; Gibbon; Gorilla; Orang-utan; and Monkeys; and plate of Anthropoid Apes.

Consult: R. Hartmann, *The Anthropoid Apes*, illustrated (New York, 1886); Huxley, *Man's Place in Nature* (New York, 1898).

APEAK′. See Anchor.

APEL, ä′pel, Johann August (1771-1816). A German writer. He was born at Leipzig, studied there and at Wittenberg from 1789 to 1793, and in 1801 was appointed a counselor at Leipzig. He wrote several dramas, drawn largely from antiquity and slightly esteemed, a *Gespensterbuch* (1810-14) and a *Wunderbuch* (1815-17), both popular. The first of them contained the story of *Der Freischütz*, which formed the basis for the text of the opera of that name. He is perhaps best known for his *Metrik* (two volumes, 1814-16), which contains an interesting study of ancient prosody.

APELDORN, ä′pel-dôrn, or **APELDOORN**. A beautiful village in the Netherlands, province of Gelderland (Map: Netherlands, D 2). It is situated about seventeen miles north of Arnhem, on a canal which joins the river Grift, a branch of the Yssel. Near Apeldorn is the royal château Het Loo, originally a hunting-lodge of the Duke of Gelderland and a favorite palace of William III. of England when Stadtholder. The principal industry is paper making, the produce of the numerous mills being in large part exported to the East Indies. Pop., 1890, 19,190; 1900, 25,761; in 1905, 31,786.

APEL′LES (Gk. 'Απελλῆς). The most celebrated painter in ancient times, the son of Pytheas, and probably a native of Colophon, on the Ionian coast of Asia Minor. The statements that he was a native of Cos or of Ephesus, seem due to his long residence in those places. He was probably made a citizen of Ephesus, and may have died at Cos, which afterward possessed an unfinished painting by him. The dates of his birth and death are unknown, but the list of his portraits shows that he lived during the last part of the fourth century B.C. He first studied at Ephesus, and afterward at Sicyon under the celebrated teacher Pamphilus of Amphipolis, where he may have learned the fine drawing in which he excelled. From Sicyon he seems to have gone to Pella in Macedonia, where he painted portraits of Philip, and became the friend of Alexander, who sat to no other painter, though frequently to him, and permitted him much freedom of speech. His most celebrated portrait represented Alexander wielding the thunderbolt, of which it was said "of the two Alexanders, Philip's is invincible, Apelles's inimitable." He also painted portraits of some of the generals of Alexander. His most celebrated works were mythological or allegorical. Very famous were his "Anadyomene" (q.v.) and his "Artemis Surrounded by Maidens." Of his painting of "Slander," in which also appeared Ignorance, Suspicion, Envy, Deceit, Remorse, and other personifications, Lucian gives a detailed description which has inspired Botticelli, Dürer, and other artists. He seems to have returned to Asia after Alexander's conquests, and most of his celebrated works were found in Asiatic cities. At Rhodes he visited the painter Protogenes, and is said to have contributed to his reputation by offering a high price for one of his pictures. He was generous in his appreciation of his rivals, though fully aware of his own merits. He admitted that Melanthius surpassed him in grouping, and Asclepiodorus in symmetry, and that Protogenes was inferior only in never knowing when to stop, which deprived his pictures of that grace, which Apelles claimed as his own. He seems to have been remarkable for his accuracy of drawing and fine coloring, probably due to a thorough theoretical and practical training. The industry with which he practiced drawing was so great as to give rise to the proverb which in the Latin version is, *Nulla dies sine linea.* Many anecdotes are related of Apelles. When his works were exposed to public view, he used to place himself behind a picture, to listen to the criticisms of the common people. A cobbler having detected a fault in the shoe of one of his figures, it is stated that Apelles instantly rectified it; but when the cobbler, on the following day, extended his criticism to the legs, the painter rushed from his hiding-place and told the cobbler to stick to the shoes, or, in the Latin version, which has become proverbial, *Ne sutor supra crepidam.* Consult: Woltmann and Woermann, *History of Painting*, Vol. I., Eng. trans. (New York, 1886); Houssaye, *Histoire d'Apelles* (Paris. 1867); Wustmann, *Apelles' Leben und Werke* (Leipzig, 1870).

APELT, ä′pelt, Ernst Friedrich (1812-59). A German philosophical writer, born at Reichenau. He studied at Jena and Leipzig, and was made professor of philosophy at Jena in 1840. His works include: *Die Reformation der Sternkunde* (Jena, 1852); *Die Theorie der Induktion* (1854); *Metaphysik* (1857); *Parmenidis et Empedoclis doctrina de Mundi Structura* (1857); *Religionsphilosophie* (1860), etc.

AP′EMAN′TUS. A churlish cynic in Shakespeare's *Timon of Athens*, supposed to have been modeled after the sketch of a similar character given in Lucian's *Public Sale of Philosophers*, a work with which Shakespeare might easily have been acquainted.

AP'ENNINES (Ital. *Appennino; Lat. Mons Apenninus*, Apennine Mount, from Cym. Celt. *pen*, hill, summit, promontory). A mountain chain belonging to the system of the Alps and extending uninterruptedly throughout the whole length of the Italian peninsula. It branches out from the Maritime Alps at the Col di Tenda, near the sources of the Tanaro. From this point the chain, under the name of the Ligurian Apennines, girdles the Gulf of Genoa in the immediate vicinity of the sea, and then runs slightly south of east inland almost across the peninsula at latitude 44°, and then southeastward, forming the watershed between the Adriatic and the Mediterranean, but gradually approaching the eastern coast, till, in the highlands of the Abruzzi, it borders close upon it; after which it takes a more southerly direction, traversing Calabria, dips under the sea at the Strait of Messina, and reappears on the northern coast of Sicily. The total length is about 800 miles, and the breadth varies from 25 to 85 miles.

Geographers divide the Apennines as follows: (1) The North Apennines, from the Col di Tenda, in the Maritime Alps, to the pass of Borgo San Sepolcro, in the neighborhood of Arezzo, on the eastern border of Tuscany. (2) The Central Apennines, from Arezzo to the valley of the Pescara, which flows between the two Abruzzi. (3) The South Apennines, from the valley of the Pescara to Cape Spartivento. (4) The Insular Apennines, or the Sicilian Range. The leading feature of the Apennines, wherever they approach the coast, is their extraordinarily steep declivities; while in Middle Italy and the adjoining portions of Upper and Lower Italy, long, terraced plateaus, lower ranges, and finally, relatively extensive coast plains mark their gradual descent on the west. The general name for these lower ranges is Sub-Apennine; but they have a variety of specific designations, such as the mountains of Carrara and Seravezza, Protomagno, and Monte Amiata, in Tuscany; the Sabine, Alban, and Volscian mountains in the former Papal States; Monte Gargano on the southeastern coast, north of Manfredonia, etc. The main chain of the Apennines does not send off spurs into the Apulian Peninsula or heel of Italy, which in the main is rather level, or only interspersed with detached groups of hills. The principal chain exhibits for the most part a dreary and barren appearance, somewhat like a vast wall, with very few projecting peaks to break the dull monotony of the scene, and therefore seldom furnishes any salient points on which the eye of the spectator can rest with pleasure. Naked, riven, covered with thick débris, the declivities seem as if scorched by the southern sun. Only in the Abruzzi, in the Sub-Apennines, and especially in the marble-bearing mountains of Carrara and Seravezza do the bold and magnificent forms of the Alps reappear.

The average height of the entire chain of the Apennines is about 4000 feet, which, however, in the north sinks down to little more than 3500 feet, and in the mountains of the Abruzzi rises to 7000 feet. Here, in Monte Corno, the highest peak of the range, forming part of the Gran Sasso d'Italia, they reach an elevation of 9580 feet. The North Apennines attain in Monte Cimone, situated in the Province of Modena, a height of 7103 feet. The highest peak of the South Apennines is Monte Polino, with an elevation of 7450 feet.

The Apennines are pierced by thirteen principal passes. These are, proceeding from north to south: (1) the pass of Savona; (2) of Bocchetta; (3) of Cisa; (4) of Monte Cimone; (5) of Poretta; (6) of Pietramala; (7) of Borgo San Sepolcro; (8) of Furlo; (9) of Serravalle; (10) of Aquila; (11) of Isernia; (12) of Arcano and Troa; (13) of Potenza.

GEOLOGY. The prevalent rock is a species of compact limestone, of a whitish-gray color, belonging to the Jura formation. Resting on the limestone is found a more recent formation of sandstone and marl, which is especially abundant in the middle region of the Sub-Apennines, and which contains an extraordinary number of fossils of the Tertiary Age. Older formations, however, frequently crop out. In the Abruzzian Apennines granite, gneiss, and schist are the prevailing rocks. On the watershed of the North and Central Apennines there are found Paleozoic clay-slate, graywacke-slate, etc. The Apennines, especially the Roman and Neapolitan, are distinguished from all other mountain chains by the rich variety of marbles which they contain. In some places the quarries seem inexhaustible. Igneous rocks are numerous in the middle and southern regions, where volcanic disturbances have produced many wonderful formations—as, for instance, the crater lakes of Albano, Nemi, Vesuvius, Solfatara.

The direction of the great chain of the Apennines is favorable to the formation on the western side of important river basins, such as those of the Arno, the Tiber, the Garigliano, and the Volturno; while on the eastern side we find nothing but small streams, in most cases destitute of affluents, hurrying down to the sea through wild, precipitous valleys. In northern Italy, the Ligurian Apennines, almost overhanging the Gulf of Genoa, develop on the southern slopes only puny streams, while their northern slopes send down, through the plains of Piedmont, large tributaries to the Po.

FLORA. Where the Apennines, in general so poorly supplied with permanent streams, exhibit a trace of Alpine abundance of water, there is no lack of rich pastures and dense forests; but usually only thin grass and wild, scrubby bushes cover the stony slopes. The greater number of the roaring forest brooks in the deep, rocky ravines display during the summer only dry beds. Where the mountains dip down to the sea, as at the Riviera of Genoa and the Gulf of Naples, a rich, distinctively southern vegetation clothes the declivities. Gigantic agaves, Indian figs, myrtle bushes, orange groves, suggest in these northern lands the splendors of the tropics. The altitudinal vegetation zones are characterized as follows: Vine and olive up to 1300 feet; chestnut and oaks from 1300 to 3300 feet; pines from 3300 to 5200 feet; shrubs and grasses above 5200 feet, succeeded above by naked rocks.

APENRADE, ä'pĕn-rä'de. A town in the Prussian province of Schleswig-Holstein. It is situated at the head of a bay of the same name, opening into the Baltic Sea, has an excellent harbor, and a considerable amount of shipping (Map: Prussia, C 1). Population, in 1895, 5564; in 1905, 7023. The environs of the town are beautiful. The first historical mention made of Apenrade relates to its destruction by the Slavs in 1148; and, indeed, its position has always laid it open to the casualties of northern war. The Prussians took possession of it in 1864. Near the town stands the castle of Brundlund, built by Queen Margaret in 1411, in which the bailiff of the place resides.

APE'PI or **APO'PHIS.** The name of two Egyptian kings of the Hyksos Dynasty. (See Hyksos.) Little is known of either, and only a few scanty memorials of them have been found. Under Apepi I., whose date is very uncertain, science and letters seem to have flourished. The celebrated *Rhind Mathematical Papyrus,* a sort of practical handbook for the solution of arithmetical and geometrical problems, bears a colophon stating that the manuscript was copied, in the thirty-third year of this king, from an original written in the reign of Amenemhat III. Apepi II. flourished about B.C. 1650, and several monuments exist bearing his name. A papyrus in the British Museum (Sallier I.) contains a legendary account of the breaking out of a war about religious matters between Apepi and Sequenen-rec, Prince of Thebes. It would seem, therefore, that Egyptian tradition regarded Apepi II. as the Hyksos ruler in whose reign began the long war for the independence of Egypt.

APEREA, ȧ-pā'rē-ȧ. See Cavy; and Guinea-pig.

APE'RIENTS. See Laxative; Purgative.

APET'ALOUS. See Flower.

A'PEX (Lat., the extreme end of a thing; point, summit). A term used in mining to designate the outcropping edge of a mineral vein or lode. As interpreted legally, it is not necessary that the edge of the vein should project above the surface of the ground, but simply above the surface of the inclosing bedrock, and both vein and bedrock may therefore be covered by soil or drift. The term outcrop in the legal sense, as used above, does not agree with the geological application of the term in all cases; for if a vein dips nearly parallel with a sloping surface, and may be exposed at a point below the apex, due to an irregularity in its dip, this second exposure, while constituting an outcrop in the geological sense, would not be one legally. According to the Revised Statutes of 1872, a miner having the apex of a vein within the boundaries of his claim is allowed to follow it along the strike until it intersects the end lines of his claim extended vertically downward. On the dip, however, he is at liberty to follow it indefinitely, even if it extends outside the vertical side lines of his surface location. This prohibits another person from sinking to the first party's vein from a point outside the latter's surface claim. This apex rule has led to many lawsuits, some of which were costly, involving property worth several million dollars. Thus, where two veins join below the surface and each is worked by a different party, both may endeavor to claim possession of the true apex, but under the apex law slighter pretenses are sometimes used by one person to gain ownership of another's vein. See Lode; Mining Claims; Outcrop; Dip; Strike; Ore Deposits; and consult: Barringer and Adams, *The Law of Mines and Mining in the United States* (Boston, 1897).

APEX OF THE SUN'S WAY. A term used to denote that point in the constellation Hercules toward which the sun's motion in space is at present directed. See Stars.

APHANIP'TERA. An order of insects, which includes the fleas, distinguished from the Diptera by having the three segments of the thorax "distinct and nearly equal, the two last rings (mesothorax and metathorax) bearing short, leaf-like appendages; and mouth-parts adapted for piercing."

APH'ANITE. See Diorite.

APHASIA, ȧ-fā'zhĭ-ȧ *or* -zĭ-ȧ (Gk. *'Αφασία,* speechlessness, from *ἀ, a,* priv. + *φάναι, phanai,* to speak). A term used to denote certain derangements of speech which are the results of certain disease or injury of the mechanism of speech. This mechanism is complicated, but it fundamentally consists of two parts, the receptive part and the emissive. When there is interference with the former, sensory aphasia is the result, while motor aphasia is the consequence of trouble with the latter. The chief types of sensory aphasia are word-deafness and word-blindness, while the chief motor aphasias are motor vocal aphasia and motor writing aphasia, or *agraphia.* The mechanism of speech has been built up gradually in the course of evolution, and consists of a number of centres in the brain. The motor speech-area is in the third frontal convolution (Broca's convolution), and injury to this part of the brain or of the nerve tracts leading from it to control the motions of the tongue and lips produces motor vocal aphasia. With this affection the person may know what he wishes to say, but is unable to say it; he may be able to talk, but not say the word he wishes. All gradations of this affection, from slight to severe forms, exist, and it is one of the commonest forms of aphasia. The auditory centre, or centre for auditory memories, or that portion of the brain which intellectually hears and understands spoken speech, is in the first temporal convolution. Any defect of this centre, or of the fibres which go from it to the motor speech centre, produces what is known as word-deafness. In this form the person may hear perfectly well, may read and speak, but does not understand spoken language. It is as though he were listening to a foreign language. The sounds of the words convey no meaning to him. There are varying degrees in this affection as well, from slight attacks in which only certain words lose their significance, to complete loss of the understanding of spoken language. The third centre is that of the optical mechanism by which the printed or written word is understood. This centre is located in the occipital lobes, and disease or injury of its cells or of the fibres which lead from it to the motor speech centre produces word-blindness. In this form of aphasia the person, although capable of seeing, does not comprehend what he sees. Words might as well be written in Chinese characters; he would understand them as well. He is capable of talking and of repeating aloud what is said to him, or of writing what may be said or what he reads. In this latter case he would be copying only. In a fourth type of aphasia, *agraphia,* which is not considered a true aphasia by many, the person is unable to write what he desires to write. He is capable of going through the motions of writing, but not understandingly. Aphasia is a symptom of many brain troubles. The most important cause is some type of hemorrhage into the brain substance, involving these areas. Tumors, injuries of the brain, exhaustion, and some of the insanities may be accompanied by aphasia. The treatment is that of the underlying disease. Consult: Gould and Pyle, *Cyclopœdia of Medicine and Surgery* (Philadelphia, 1900).

A'PHEK. (1) A place near Sidon (Josh. xiii. 4), having a temple to Ashtoreth; probably the modern Aphka at the source of Nahr Ibrahim. (2) One of the "twenty and two cities with their villages" belonging by inheritance to the tribe of Asher (Josh. xix. 30; Judges i. 31). (3) A stronghold near Megiddo, where the Philistines assembled their army for the battles of Gilboa (I. Sam. xxix. 1) and Ebenezer (I. Sam. iv. 1), and from which Benhadad and Hazael (I. Kings xx. 26; II. Kings xiii. 17) made their attacks upon Samaria. Over one hundred thousand of the Syrians were slain in one day's battle; the rest fled into Aphek, where twenty-seven thousand more were killed by a falling wall (I. Kings xx. 29, 30). It is probably identical with Apukn in the annals of Tehutimose III. (1503-1449).

APHE'LION (Gk. ἀπό, *apo*, away + ἥλιος, *hēlios*, the sun). That point in the elliptical orbit of a planet which is most remote from the sun. The opposite point, or that nearest to the sun, is styled the perihelion. At the former point, the swiftness of the planet's motion is least, and begins to increase; at the latter, it is greatest, and begins to decrease. This irregularity of motion is most remarkable in comets, since their orbits deviate most from the circle. See APSIDES.

APH'ELIOT'ROPISM, or NEGATIVE HELIOTROPISM. That form of sensitiveness by virtue of which plant organs direct their axes away from the source of incident light. Certain roots show this reaction to light; e.g., those of mustard seedlings. It is seen also in the tendrils of *Bignonia capreolata*. See HELIOTROPISM.

A'PHID (probably from Gk. ἀφειδής, *apheidēs*, unsparing, from ἀ, *a*, priv. + φείδεσθαι, *pheidesthai*, to spare). An insect of the family Aphididæ, commonly known as plant-lice, which live either free on the foliage, bark, or roots of plants, or inclosed in galls. They nourish themselves on the sap of their plant-hosts, which they suck up through a long slender haustellum. They are minute, the largest being only one-fourth of an inch long. They are usually green or brown and somewhat pyriform in shape. Most of the forms that live on roots underground have neither compound nor simple eyes. Many species secrete a cottony, protective coat. At the posterior end of the abdomen most aphids have a pair of tubes from which they discharge a liquid for defence against their enemies, and also excrete from the anus a sweet liquid which is eagerly collected by ants and some other insects. This latter liquid is called 'honey-dew' and often falls upon and varnishes the leaves of plants. When the wind is blowing it may fall to the ground as a fine spray. Although ants are indirectly injurious to plants by protecting or even cherishing the aphides, they may be said to be beneficial in collecting the honey-dew, since its presence on the leaves or stems is apt to form a favorable substratum for the growth of parasitic fungi which are injurious to the plants.

Dimorphism, or even polymorphism is very common among aphides. Thus the cospecific forms which live on the roots of plants and those that live on the foliage may exhibit certain structural differences. The sexes may be winged or wingless and the females may lay eggs or bring forth their young alive. In the spring the fertilized eggs give rise to females and these may produce females parthenogenetically for several generations till later in the season, either at times of drought or on the approach of winter, both males and females make their appearance and become the parents of fertilized eggs. These eggs hatch the following spring as the "stem mothers" and the cycle is repeated.

Aphides stunt or kill growing tips, weaken entire trees by impoverishing their sap, and some species produce galls or other abnormal growths. They may destroy entire crops of cereals. Nearly all garden vegetables suffer from their ravages, and hot-house plants are particularly infested by them. The price of hops from year to year varies largely according to the abundance of the hop aphis. See HOP-LOUSE.

To the same group belongs the grape-vine phylloxera of Europe and America. Inundation of the ground during cold weather is fatal to this pest. Carbon bisulphid, and fumigation with tobacco, and spraying with neutral soaps are effective checks. Young fruit and shade trees may also be treated with soap washes, as well as with hydrocyanic-acid gas applied under closed tents. Birds, spiders, syrphus-fly larvæ, and ladybird beetles destroy great numbers of aphides and they are persecuted by deadly parasites. Indeed were it not for the many insect foes of aphides there would be little or no vegetation. The winter eggs of these insects may endure any amount of cold, but a cold, wet spell in the spring is often fatal to the newly hatched aphides. Among the most important species of this group are the 'grain-lice,' melon or cotton aphis, various peach and apple aphides, pea 'louse,' etc.

BIBLIOGRAPHY. Thomas, *Eighth Report State Entomologist of Illinois* (Springfield, 1879); for Europe, Buckton, "Monograph of British Aphides," *Ray Society* (London, 1879-83). For bibliography of principal works on these insects see W. D. Hunter, *Bulletin 60, Iowa Agricultural Experiment Station* (Ames, Iowa, 1901).

APHIS-LION. The larva of a lace-winged fly, especially of the family Hemerobiidæ, which feed on plant lice. It is closely related to the ant-lions and golden-eyed flies. See LACEWING.

APHO'NIA (Gk. ἀφωνία, from ἀ, *a*, priv. + φωνή, *phōnē*, voice, sound). The term used in medicine to signify a more or less complete loss of voice. It is altogether distinct from mutism, in which it is impossible to form articulate sounds, and in most cases the voice is not entirely gone, but only more or less lost or suppressed. The voice is essentially produced by three distinct agents—viz. (1) the expiration of air, (2) the opening of the glottis, and (3) the tension of the vocal cords; and hence anything interfering with expiration, or with the functions of the glottis and vocal cords, may cause aphonia. Thus, it may result from paralysis of the respiratory muscles, from pulmonary emphysema, and sometimes from pneumonia; or it may be caused by diseases of the larynx, as chronic laryngitis, œdema of the glottis, polypus, etc.; or by pressure on the larynx caused by abscesses, vegetations, and any kind of morbid growth; or it may be traced to some functional or organic disturbance of the inferior vocal cords. Thus, the muscular fibres which act on these cords may become affected in acute laryngitis by extension of the inflammation, or their action may be impeded by the pressure of false membrane in croup. Again, in cases of lead or phosphorus poisoning, there is aphonia due to fatty degeneration of the muscles. Not infrequently aphonia may be traced to compression of the recurrent or inferior laryngeal nerve, which is the nerve-supplying motor power to all the muscles of the larynx, with one trifling exception. Such pressure is not infrequently caused by aneurism, abscess, tumor, etc. In the same way, a wound or contusion of the pneumogastric nerve, or one of the recurrent branches, will cause aphonia or, more commonly, an extremely hoarse modification of the voice, in consequence of the laryngeal muscles being paralyzed on one side and remaining active on the other. There are cases of direct nervous action being interfered with; but there are many cases of what may be termed *reflex aphonia,* as when the voice is often more or less lost in the course of pregnancy when accompanied by convulsions, or in consequence of the presence of intestinal worms, or after the rapid suppression of an exanthematous rash, or of a long-continued hemorrhagic discharge. Aphonia is, moreover, very commonly associated with hysteria.

When aphonia is not due to irremovable causes, as tumors, fatty degeneration of the laryngeal muscles, etc., it generally disappears after an interval. It occasionally assumes remarkable intermittent shapes.

In those cases which are amenable to treatment, emetics, electricity, strychnine, leeching, blistering and local application of nitrate of silver, have been found to be the most useful remedies.

APH′ORISM (Gk. *ἀφορισμὸς*, *aphorismos*, a limitation, definition, from *ἀπό*, *apo*, away + *ὁρίζειν*, *horizein*, to bound, divide). A maxim or any short and significant saying; such as, "Custom is a second nature." A complete work is sometimes written in the form of a series of aphorisms, arranged in due order, and leaving their connection to be traced by the reader's reflection.

APHRAATES, ȧ-frä′tēz. A Persian Christian of the Fourth Century, who, after his conversion from heathenism, took the name of Jacob, and was known as the "Persian Sage." He is said to have been an opponent of Arianism, and after his conversion lived at Edessa, and later at Antioch. According to Professor William Wright, he was bishop of the convent of Mar Matthew near Mosul, and composed his works in 344, 345, and 377. His writings consist of twenty-two alphabetical homilies (ed. W. Wright, London, 1869; Graffin, Paris, 1894), and the separate homily *On the Cluster,* the text of which has been recovered lately. In the *De Viris Illustribus* (written before 496) of Gennadius of Marseilles, and in the ancient Armenian version, published by N. Antonelli (Rome, 1756), the homilies were ascribed to Jacob of Nisibis, who died in 338. The real author, however, is cited by name by Abhdisho, and by Elias of Nisibis (Eleventh Century), in his *Chronicle.*

Consult: W. Wright, *Syriac Lit.*, p. 32 (London, 1894); Duval, *Littérature Syriaque,* p. 226 (Paris, 1899); J. Forget, *De Vita et Scriptis Aphraatis* (Louvain, 1882); and Thalhofer, *Bibliothek der Kirchenväter* (Kempen, 1869-86), where eight of the homilies are translated. Germ. trans. by Bert in Von Gebhardt and Harnack, *Texte und Untersuchungen* (Leipzig, 1888); French by Parisot in ed. Graffin.

APHRODISIA, ăf′rō-dĭz′ĭ-ȧ. The name given to the festival celebrated in honor of Venus.

APHRODISIAC, ăf′rō-dĭz′ĭ-ăk (Gk. *ἀφροδισιακὸς*, *aphrodisiakos*, pertaining to Aphrodite, or Venus, goddess of love). A name generally used in medicine for drugs that excite erotic desire, though the name, strictly used, may also include any physical or mechanical means employed for the same purpose. All drugs that are tonic in their effects and which promote the health of the body are indirectly aphrodisiac in their tendency. Such are strychnine, iron, quinine, etc. True aphrodisiacs are very rare, and it is in fact doubtful if there be any whose use is not injurious if given in effective doses. Such are hashish (*Cannabis Indica,* cantharides, a violent and dangerous irritant), *Blatta Orientalis,* and *Damiana,* a preparation made from a species of *Turnera* found in Mexico. Drugs which have the contrary effect are called anaphrodisiacs. See ANAPHRODISIAC.

APHRODITE, ăf′rō-dī′tē. See VENUS.

APH′RODITOP′OLIS (*Aphrodite* + Gk. *πόλις*, *polis*, city). The name of several cities in ancient Egypt under the Greeks.

APH′THÆ (Gk. *ἄφθα*, *aphtha*, eruption, ulceration). An affection of the mucous membranes of the gastro-intestinal tract, occurring chiefly in infants, sometimes serious, and due to the growth of minute fungus parasites. Aphthous patches generally appear in the mouth, and are usually whitish in the early stages, but later the areas may coalesce or ulcers may form. Loss of appetite, diminution in weight, and general ill-health are common symptoms. Aphthæ is the result of nursery neglect. Nipples, bottles, etc., used in feeding, should be kept clean and thoroughly sterilized by solutions of boric acid. See THRUSH.

APH′THOUS FE′VER. See FOOT AND MOUTH DISEASE.

APH′YDROT′ROPISM, or NEGATIVE HYDROTROPISM. That form of sensitiveness by virtue of which a plant organ turns its axis away from the source of diffusing moisture. The phenomenon is seen in the fruiting bodies of many fungi. The vegetative filaments remain in the moist substratum (being positively hydrotropic), but the reproductive filaments, which bear the spores, grow out into the much drier air. See HYDROTROPISM.

APIA, ä′pē-ȧ. The principal town in the Samoan Islands, South Pacific Ocean. It is situated on the northern coast of the German island of Upolu, in lat. 13° 49′ S., long. 171° 48′ W. It has an open harbor, and is the chief commercial centre of the Samoan group. It consists chiefly of one long street running along the harbor. There is a Roman Catholic church and several schools. On March 15, 1889, Apia was visited by a disastrous hurricane, in which several vessels, including one American and two German warships, were destroyed, and 146 lives lost. Apia was constituted a municipality in 1879, and was for a time under the joint supervision of the British, American, and German consuls. Its population is 1300, of whom about 250 are Europeans. Apia is the seat of a United States consulate.

A′PIA′NUS, Petrus (1501-52). A German astronomer and geographer, born at Leisnig, Saxony. His name was Peter Bennewitz, or Bienewitz (*Biene* is German for bee, which in Latin is *apis*—whence his adopted name). He was, from 1527, professor of mathematics at Ingolstadt, and was celebrated as a mathematician, astronomer, and general savant, and especially as a cosmographer. He was the inventor of a number of philosophical instruments, and some of the earliest maps of America were printed by him. The best-known among his writings is the *Cosmographia* (Landshut, 1524; Antwerp, 1529).

AP′ICES. See Numeral.

APICIUS, ă-pĭsh′ĭ-ŭs, Marcus Gabius. A Roman epicure, who lived in the time of Augustus and Tiberius, and was celebrated for his luxurious table and his acquirements in the art of cookery. When, by the gratification of his favorite indulgence, he had consumed the greater part of his fortune, and had only some $400,000 left, he poisoned himself, in order to avoid the misery of plain diet. Two other gourmands—one in the time of Pompey, the other in the reign of Trajan—are mentioned under the name Apicius. The Roman cookery-book, *Cœlii Apicii de Re Coquinaria*, ascribed to Apicius, belongs to a much later time, inasmuch as it abounds in inaccuracies and solecisms. It is edited by Schuch (Heidelberg, 1867).

AP′ICUL′TURE. See Bee-Keeping.

APINUS, ȧ-pē′nụs, Franz Maria Ulrich Theodor (1724-1802). A German physicist, born at Rostock. He devoted himself to the study of medicine and the exact sciences, and in 1757 he was appointed professor of physics at Saint Petersburg. He is chiefly remembered for his extension of Franklin's electrical theory, but also published valuable works on various other branches of the physical sciences, including a work *On the Distribution of Heat at the Surface of the Earth* (1762).

A′PION (Gk. Ἀπίων). An Alexandrian grammarian of the First Century A.D. He was born in the Oasis in the Libyan Desert, but came early to Alexandria, where Didymus received him into his house. He became a pupil of Apollonius and Euphranor, and eventually succeeded Theon as head of the Alexandrian School. He traveled much in the cities of Greece lecturing on Homer, whereby he gained great renown, but more from the brilliancy of his manner than from the value of the matter presented. His journeys extended to Rome, where his boastful nature won him from the Emperor Tiberius the nickname *cymbalum mundi* ("the cymbal of the universe"). Later, as leader of the anti-Jewish party, he was sent during the reign of Caligula at the head of an embassy to Rome to oppose the Jewish delegation led by the philosopher Philo. Josephus's tract, *Against Apion*, answering charges made on this occasion, is one of our chief sources of knowledge in regard to him. In the reign of Claudius, Apion lived and taught at Rome. His chief writings were a comprehensive work on the history and civilization of Egypt, which contained the famous story of Androcles and the Lion, preserved by Aulus Gellius (v. 14); and an Homeric glossary, which may be identical with that in the appendix to the *Etymologicum Gudianum*, page 601, edition Sturz (Leipzig, 1818). The scanty fragments of his historical works are collected by K. and Th. Müller, *Fragmenta Historicorum Græcorum*, iii. 506-516 (Paris, 1868-74).

A′PIOS TU′BERO′SA. See Ground-nut.

A′PIS (Gk. Ἆπις). A sacred bull worshiped at Memphis by the ancient Egyptians. His Egyptian name, *Hap*, is of uncertain etymology. Originally he may have been an independent local divinity, but in historical times he appears as the sacred animal of the god Ptah of Memphis. Later he was considered as an incarnation of Osiris, of Sokaris, or even of the sun; but usually he was, through a false etymology, associated with the Nile (*Ha'pi*). According to Greek accounts, he was not allowed to live longer than twenty-five years, and if he survived his allotted time was secretly drowned in a well. The bodies of the Apis bulls were carefully embalmed and were buried in subterranean rock-hewn tombs, in the Serapeum at Memphis (not to be confounded with the famous Serapeum of Alexandria), where Apis, under the name Serapis (a combination of Osiris and Apis), was worshiped as the patron of the dead. Three tombs, with numerous Apis mummies, were discovered by Mariette in 1851. After the death of an Apis bull, the country was searched, sometimes for years, until another was found bearing the sacred marks. As to the precise nature of these marks, traditions vary widely. The animal, however, must be black, with certain white spots, and a peculiar knot under the tongue. When found, he was solemnly conducted to Memphis and installed in the temple with great festivities. The day of his installation and that of his birth were celebrated annually, and oracles were derived from his movements and from the nature of his appetite. Even the cow which had become the mother of an Apis bull received divine honors. The sumptuous worship of this animal seems to have impressed the Greeks as more remarkable than that of any other sacred animal. For illustration, see Egypt.

AP′LACOPH′ORA. See Amphineura.

AP′LANAT′IC LENS (not wandering, from Gk. ἀ, *a*, priv. + πλανᾶσθαι, *planasthai*, to wander). An achromatic lens corrected for spherical aberration (q.v.), so that all rays of light which emanate from one point and pass through the lens are focused at a point. The construction and correction of photographic lenses is fully described, from the technical standpoint, in Otto Lummer's *Photographic Optics*, translated by Silvanus P. Thompson (New York, 1900). See Light and Lens.

APOC′ALYPSE. See Revelation.

APOC′ALYP′TIC LIT′ERATURE (Gk. ἀποκαλύπτειν, *apokalyptein*, to uncover, reveal). The designation of certain alleged prophecies and revelations of Jewish and Christian authorship dating from about B.C. 200 to about A.D. 200. Their main theme is the problem of the final triumph of the Kingdom of God. The Jewish apocalypses profess to reveal the future of Israel with the coming of the Messiah as the savior and avenger of God's elect. The Christian interpolations and additions, written from the point of view of faith in Jesus as the Messiah, unveil the future struggles and ultimate victory of the Church and the future state of the evil and the good. Within these limits large opportunity was found for treating of a variety of occult subjects. The purpose of these works was to vindicate God's ways to the faithful, who were sorely tried by the apparent triumph of the wicked, i.e., the heathen without and the irreligious within Israel. The fundamental ideas represented are those of the Pharisaic Judaism of the popular, non-scholastic type—legalistic indeed, but full of passionate earnestness. This literature is pseudepigraphic. The various writings were put forth under the name of ancient worthies, long since dead, as Enoch or Moses. Hence the form of statement is largely predictive. But it is not difficult, in most cases, to see that the pretended prediction is but the résumé of past history. Where the pseudo-prophecy ends and the attempt at prediction really begins, the author is seen to be dealing with his own times, and the date of the work is thus betrayed. The tone of these works is one of great assurance, well adapted to deceive the uncritical. They were once widely accepted as genuine prophecies, and as such found a warm reception in the Christian Church during the first four or five centuries. In time they began to be looked upon with suspicion, and were gradually dropped from use, except in the less enlightened circles of the Church. Several of the most important are known to-day only in such translations as the Ethiopic or Syriac, though written originally in Hebrew (Aramaic) or Greek. These works are of value to-day because of the insight they afford us into the growth of eschatological and Messianic doctrines among the Jewish people just previous to the rise of Christianity, especially since these doctrines have, in a purified form, found a permanent place in the Christian system.

The following list contains all the titles about which anything positive can be asserted. Many such works have probably been lost. (1) *The Book of Enoch* is a compilation from several sources. Nearly all of the book is to be dated before B.C. 63. It professes to give revelations to Enoch of the deliverance of Israel and the coming of the Messianic Kingdom. It also contains much about angels and supramundane matters. The book is quoted in Jude 14. (2) *The Sibylline Oracles* were originally a "Jewish work under a heathen mask," in imitation of the utterances of the heathen Sibyls, but written in wretched Greek hexameter. The present collection in fourteen books represents the growth from beginnings made by Hellenistic Jews in the second century B.C. The latter portions are by Christian hands. The oldest and most important parts are in Book iii., lines 97-828. These oracles were highly esteemed and frequently quoted by the early Church Fathers. (3) *The Psalms of Solomon.* A collection of eighteen patriotic and religious psalms, written originally in Hebrew (now extant only in Greek) shortly after Pompey made Judæa subject to Rome (B.C. 63). The apocalyptic element in these is very small. Psalm xvii. contains strong Messianic hopes. These psalms are interesting for comparison with the early Christian hymns in Luke i. and ii. (4) *The Book of Jubilees,* or *Leptogenesis* (Little Genesis), purports to be a revelation made to Moses of the course of events from Adam to Moses's own day. The history is divided into fifty periods of fifty years each; hence the name of the book. The outline is, of course, that of Genesis, but great liberties are taken with the text. Deeds of patriarchs not approved in Genesis are even praised; the patriarchs are all strict legalists. The book was written near the beginning of the Christian era. (5) *The Testaments of the Twelve Patriarchs* gives the dying exhortations of each of the twelve sons of Jacob to his children. Each testament deals with some virtue or fault which the patriarch exemplified in his life, and also contains predictions relating to the future of his descendants. These predictive portions have been largely worked over by Christian hands. The original Jewish parts belong to the First, possibly the Second, Century B.C. (6) *Liber Antiquitatum Bibliarum* is the title of a pseudo-Philonic work somewhat similar to *Fourth Esdras.* It is perhaps pre-Christian in date. (7) *The Secrets of Enoch* is a portion of the once extensive Enoch literature. It is extant only in a Slavonic version. It contains a great deal about Paradise, the several heavens, angels, the secrets of creation, the millennium, and similar subjects. The first century A.D. is its most probable date. (8) *The Assumption of Moses,* or *Testament of Moses,* written shortly after the death of Herod (B.C. 4), gives the parting communications of Moses to his successor, Joshua, in which he unfolds the course of Israel's history down to the time of the successors of Herod. Incidentally the work furnishes a valuable view of the attitude of the Pharisees toward the Sadducees. (9) *The Apocalypse of Baruch* is one of several *Baruch* books once current in Jewish circles. It dates from A.D. 50-90, and illustrates the Messianic hopes of Pharisaic Judaism just before and after the fall of Jerusalem, 70 A.D. (10) *Fourth Esdras* (*Second Esdras* in the English Apocrypha of the Old Testament) contains seven alleged visions of Ezra, the famous scribe. His grief over the hard fate of Zion is relieved by the revelation of the coming Messianic era and punishment of the wicked. The book was written by a Jew, probably about 81-96 A.D., but has been revised and added to by Christian hands. (11) *The Ascension of Isaiah* is a compilation containing (1) *The Martyrdom,* (2) *The Vision,* and (3) an *Apocalypse* treating of the history of the Church to the end of the Neronian persecution. The compilation was made about 100 A.D. Only *The Martyrdom* is of Jewish origin.

The following apocalyptic works are of minor importance: (12) The various *Adam* books. (13) *The Testament of Abraham.* (14) *The Rest of the Words of Baruch.* (15) *The Prophecy of Hystaspes.* (16) *The Prayer of Joseph.* (17) *The Prophecy of Eldad and Modad.* (18) *The Apocalypse of Elijah.* (19) *The Apocalypse of Zephaniah.* (20) The various *Noah* books. (21) *The Book of Zoroaster.* (22) *The Book of Seth.*

In the foregoing article no mention has been made of the very large number of apocalyptic writings of distinctly Christian origin which were produced from the Second Century onwards, to satisfy an unhealthy craving for the occult and marvelous, or to embellish the stories of the saints. For these and the "Shepherd of Hermas," see APOCRYPHA (*of the New Testament*). For the two canonical apocalypses, The Book of Daniel and The Revelation of St. John, see the special articles treating of the same.

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(translation New York, 1885-91); article "Apocalyptic Literature" in the *Encyclopædia Biblica* (New York, 1899).

APOC'ALYP'TIC NUMBER. The mystical number which is given in Revelation xiii. 18 as the designation of the beast of the ten horns and seven heads (v. 1), and which, in the accepted text, reads "Six hundred and sixty and six." ("He that hath understanding, let him count the number of the beast; for it is the number of a man . . . six hundred and sixty and six.") Many interpretations of this number have been given; but it has been generally held that, on the basis of the Hebrew numerical alphabet, which contains no characters for *e* or *a*, the author intended to represent Nero—

$$\left.\begin{matrix} \text{N} & \text{(e)} & \text{R} & \text{O} & \text{N} & \text{K} & \text{(e)} & \text{S(a)} & \text{R} \\ 50 & & 200 & 6 & 50 & 100 & & 60 & 200 \end{matrix}\right\} 666$$

It is claimed, however, that there is a variant reading for the text that gives the number "Six hundred and sixteen," which, on the basis of the Greek numerical alphabet, would represent Gaius (Caligula)—

$$\left.\begin{matrix} \text{G} & \text{A} & \text{I} & \text{O} & \text{S} & \text{K} & \text{A} & \text{I} & \text{S} & \text{A} & \text{R} \\ 3 & 1 & 10 & 70 & 200 & 20 & 1 & 10 & 200 & 1 & 100 \end{matrix}\right\} 616$$

In confirmation of this second reading it is urged that an author writing for Greek readers would be more likely to use the Greek alphabet, with which they were familiar, than the Hebrew, with which they were unacquainted. But it is to be noticed that in ix. 11, a Hebrew as well as a Greek word is used for the mystical idea the author has in mind (" . . the angel of the abyss, in Hebrew called Abaddon, and Greek Apollyon"), and in xvi. 16, a Hebrew word alone, (" . . the place which is called in Hebrew Har-Magedon"). It is not impossible, therefore, that Hebrew letters were intended to be represented by the number here given. In fact, the variant reading may have quite naturally come from the voluntary omission by copyists of the second *n* of *Neron* in the first reading—Nero being the more familiar form. In any case, however, it is certain that the author had in mind a Roman emperor hostile to the Christians, whose name it was not safe for him to mention (cf. xvii. 9, 18, where the "seven mountains, on which the woman sitteth," and "the great city, which reigneth over the kings of the earth" clearly indicate Rome). See Antichrist and Revelation of Saint John.

APOCALYPTIC WRIT'INGS. See Apocalyptic Literature and under Apocrypha.

AP'OCATAS'TASIS (Gk. ἀποκατάστασις, *apokatastasis*, restoration). A word found in Acts iii. 21 (comp. Rom. viii. 21, Eph. i. 9, Col. i. 19). It has been interpreted by some as pointing to the final salvation of all men, and has been employed as a technical term with this signification. See Universalism.

APOCHROMATIC LENS. See Microscope.

APOC'RYPHA (Gk. ἀπόκρυφος, *apokryphos*, hidden, concealed, from ἀπό, *apo*, away + κρύπτειν, *kryptein*, to hide), or Apocryphal and Pseudepigraphical Writings. I. *Old Testament.*—A word rendered current by the Jews of Alexandria. In the earliest churches, it was applied with very different significations to a variety of writings. Among the various views that have been brought forward to account for the application of the term to the non-canonical writings of the Bible (more particularly of the Old Testament), the most probable is to connect the word with the practice existing among religious and philosophic sects to withhold from the general public writings embodying the special tenets of the sect and communicated only to the inner circle of adherents. Such books generally bore the name of a patriarch, prophet, or even apostle, purporting to be the author. In consequence, the term 'apocryphal' also acquired an unfavorable meaning, and by the Fourth Century A.D. was applied also to writings which were regarded as pseudepigraphical and forgeries; but in connection with the Bible it has been customary, since the time of Jerome, to apply the term to a number of writings which the Septuagint (the Greek translation of the Old Testament) had circulated amongst the Christians, and which were sometimes considered as an appendage to the Old Testament, and sometimes as a portion of it. The Greek Church, at the Council of Laodicea (A.D. 360), excluded them from the canon; the Latin Church, on the other hand, always highly favored them; and finally the Council of Trent (1545-63) received them in part for edification, but not for the "establishment of doctrine." All the Protestant churches in England and America, except the Church of England, reject their use in public worship. In French and English Bibles of the Sixteenth Century it was customary to bind up the Apocrypha between the authorized versions of the Old and New Testaments, but in the Seventeenth Century this ceased, and, as a consequence, this curious, interesting, and instructive part of Jewish literature acquired to a large extent merely scholarly interest. The Apocrypha is not published by the great Bible societies, but was revised by the Bible Revision Committee, and is separately published by the University Press. The Old Testament Apocrypha consists of fourteen books: (1) First Esdras (q.v.); (2) Second Esdras (q.v.); (3) Tobit (q.v.); (4) Judith (q.v.); (5) The parts of Esther not found in Hebrew or Aramaic; (6) The Wisdom of Solomon; (7) The Wisdom of Jesus, son of Sirach, or Ecclesiasticus (q.v.); (8) Baruch (q.v.); (9) The Song of the Three Holy Children; (10) The History of Susanna; (11) The History of the Destruction of Bel and the Dragon (q.v.); (12) The Prayer of Manasses, King of Judah (see Manasseh); (13) First Maccabees (q.v.); (14) Second Maccabees (q.v.). The precise origin of all of these writings cannot be ascertained. Their composition covers, roughly speaking, the period B.C. 150 to A.D. 75. Some, as e.g. The Wisdom of Jesus and the First Maccabees, were originally written in Hebrew; others, as the Fourth Esdras and The Wisdom of Solomon, in Greek. In respect to contents, they may be divided into (a) historical (the First Esdras, First and Second Maccabees); (b) legendary (Tobit, Judith, Additions to Esther, Song of Three Holy Children, Susanna, Bel and the Dragon); (c) prophetical (Baruch, Prayer of Manasses); (d) apocalyptic (Second Esdras); (e) didactic (The Wisdom of Solomon, The Wisdom of Jesus).

Betraying to a larger extent the religious influences current in Hellenistic Judaism than those which prevailed in Palestine, it was natural that these writings should have been looked upon with more favor outside of the strictly rabbinical circles than within those circles;

though it should be added that this remark applies to some of the writings more than to others. So, e.g. in the Talmud, quotations from The Wisdom of Jesus are introduced and quoted in a manner which indicated the high esteem in which the work was held. Still the exclusion of these writings from the authorized canon, due largely to the fact that their composition lay too close to the period when to the earlier divisions (a) Law, and (b) Prophets, the third division (c) Hagiographa was definitely added, led to their being gradually regarded with disfavor, and as in the course of time Rabbinical Judaism concentrated its force upon the study of the Talmud, the Apocrypha were entirely lost sight of. On the other hand, the affiliation of early Christianity with Hellenic Judaism finds an interesting illustration in the readiness with which the Septuagint translation, which included the Apocrypha, was accepted as an authorized text.

Besides the above-mentioned writings, there are others which may likewise be included under the term apocryphal, although not officially recognized as such. They are pseudepigraphical, i.e. attributed to fictitious authorship. We may again distinguish in each class, legendary, apocalyptic, and poetical writings. To the old Testament division belong the following: (1) The Testament of Adam, which is a Jewish romance dealing with Adam and Eve after the Fall. (2) The Book of Jubilees, a commentary upon Genesis, containing chiefly legendary additions. (3) The Testament of the Patriarchs, Abraham, Isaac, and Jacob. (4) The Apocalypse of Abraham. (5) The Testaments of the Twelve Patriarchs, furnishing the dying instructions of the twelve sons of Jacob. (6) A Life of Aseneth, giving the circumstances of Joseph's marriage with Aseneth. (7) The Testament of Job. (8) The Testament of Solomon, chiefly a magical book. (9) The Contradictio Salomonis, a contest in wisdom between Solomon and Hiram. (10) The Ascension of Isaiah. (11) The Pseudo-Philo's Liber Antiquitatum Bibliarum, a legendary summary of Biblical history from Adam to Saul. (12) The Book of Jasher, legendary commentary on the Hexateuch. (13) The Book of Noah. These embrace the legendary writings, and in addition there are several other books belonging to this division, of which only the titles and some references are known. To the apocalpytic division belong: (1) The Book of Enoch. (2) Sibylline Oracles. (3) The Assumptio Mosi. (4) Apocalypse of Baruch (of which there are several versions). (5) The Rest of the Words of Baruch. (6) A short prophecy of Jeremiah. (7) The Apocalypse of Elias. (8) The Apocalypse of Zephaniah. (9) The Revelation of Moses. (10) The Apocalypse of Esdras, and again some others, of which only the titles are known. Of poetical writings there are: (1) Psalms of Solomon, a collection of eighteen, or, according to some versions, nineteen psalms. (2) Additions to the Psalter. (3) Lamentation of Job's Wife. The date of composition of most of these writings is uncertain. Almost all give evidence of having been recast, and while most are undoubtedly of Jewish origin, they have to a large extent been made to accord with Christian doctrines. It will also be apparent that the dividing line in the case of these writings, between apocalyptic literature and didactic or legendary compositions, becomes at times very faint. See articles upon the separate books, as mentioned above; the following division on New Testament Apocrypha; also APOCALYPTIC LITERATURE.

II. *New Testament.*—The New Testament Apocrypha and Pseudepigrapha include numerous works purported to have been written by apostles or their associates, but which did not secure a general or permanent recognition. As the Church became ever more convinced that the writings now constituting the New Testament were the only authoritative documents of the Apostolic Age, these other works were looked upon with suspicion, and finally were termed 'apocrypha'—that is, works whose origin was uncertain, whose contents were of doubtful character, and whose common use was not to be approved. This literature was extensive, and continued in circulation in spite of the disapproval of the more enlightened. As time went on the earlier works were continually revised, enlarged, and imitated, so that the list finally became a very long one. The reason for this wide circulation was that these writings satisfied a strong though abnormal longing on the part of the less enlightened. The canonical books of the New Testament are marked by a noble simplicity and reserve. But there were many who craved something more marvelous and startling. There were also those whose doctrinal tendencies found but slight support in the New Testament. Hence works were written in the name of an apostle or as records of an apostle's deeds, in which suspicious doctrines were placed under apostolic sanction. These apocryphal works may be classified thus: (a) Gospels; (b) Acts of Apostles; (c) Epistles; (d) Apocalypses; (e) Didactic Works.

(a) Apocryphal Gospels may be divided into several groups. (1) Those dealing with the nativity of the Virgin, her childhood, and the birth, infancy, and childhood of the Saviour. Probably the earliest of these is the *Protevangelium of James.* It is but a fanciful enlargement of the nativity narratives in the canonical Matthew and Luke, with perhaps a little assistance from trustworthy tradition. It was written early in the Second Century. Closely connected with the *Protevangelium* is the *Gospel of Thomas,* which treats of the childhood of Jesus. He is represented as even then working miracles and as fully conscious of his divine mission. This work was much used by Gnostics. It is to be dated not later than A.D. 150. The matter contained in these two works was combined with additions and variations in the later *Nativity of the Virgin Mary,* falsely ascribed to Matthew. A still later form of the same material is found in the so-called *Arabic Gospel of the Infancy,* which devotes much space to the experiences as of the Holy Family in Egypt. In *The History of Joseph the Carpenter,* Jesus is represented as telling his apostles of his mother's betrothal, of his own birth, and, more particularly, of the last sickness and death of Joseph. (2) There is a second group of writings treating of the Passion and post-mortem experiences of Christ. *The Gospel of Nicodemus* is a late compilation of two earlier and altogether separate works, *The Acts of Pilate* and *The Descent of Christ into Hades. The Acts of Pilate* is probably the older, but in its present form an enlargement of the reputed official acts or reports of Pilate, to which reference is made by Justin Martyr (c.

150 A.D.). The second work is mainly an imaginary narrative represented as having been told by two men raised from the dead at the time of the crucifixion (comp. Matt. xxvii. 52-53). (3) Other works, more nearly like the canonical Gospels, were especially favored in particular circles or localities. The Gospel of the Hebrews, probably the same as the Gospel of the Nazarenes, was one of the earliest gospel-books. It was probably a secondary form in Aramaic of the Aramaic original of our canonical Greek Matthew, written perhaps as early as A.D. 100 for the use of the Aramaic-speaking Christians of Palestine and Syria. The later Jewish-Christian sect of the Ebionites had a gospel called *The Gospel of the Twelve*, written in Greek, probably not earlier than A.D. 200, and heretical in tendency. A *Gospel of the Egyptians* was in existence in the latter half of the Second Century. It was probably used in the country districts of Egypt. (4) Other gospels claimed apostolic authorship. The most important of such is the *Gospel of Peter*. Serapion, Bishop of Antioch, A.D. 190-211, discovered that this work was in use among the Christians of his diocese. Its use was neither approved nor severely condemned by the orthodox bishop. A large fragment of this gospel was discovered in Egypt in 1885 and published in 1892. Though written early, certainly in the Second Century, it seems never to have been used as an authoritative gospel in the regular Church service. It is somewhat heretical in tendency. A *Gospel* or *Traditions of Matthias* (another name for Zacchæus, the publican), was known to Origen. This, with a *Gospel of Philip*, was used by Egyptian Gnostics. Other gospels of similar character were circulated under the names of Andrew, Barnabas, and Bartholomew. (5) Other forms of gospel material were in circulation in early times. Sayings of Jesus not contained in any known treatise are met with occasionally. (See AGRAPHA.) A most interesting fragment of a collection of such was found in Egypt in 1897—the so-called *Logia* fragment. (See AGRAPHA.) (6) In addition to the above there were gospels of an avowedly heretical type. Of these, the *Gospel of Basilides*, written by the famous Gnostic for the use of his disciples, and *Marcion's Gospel*, which was but a mutilated Luke, were the most important.

(b) Apocryphal *Acts* of Apostles. The beginning of this literature appears to have been the work of one Lucius, of Charinus, in the second half of the Second Century. He composed the *Acts*, or *Travels* (Περίοδοι) of the Apostles *Peter, John, Thomas, Andrew,* and *Paul* (each apostle treated separately). His sources were the New Testament Acts and Epistles, current oral tradition, and his own imagination. In these *Acts* certain Gnostic tendencies were manifest, such as a mystic doctrine of the Cross and those ascetic teachings that exalt celibacy as a form of higher life. Later works of like character were the *Acts of Matthew*, of *Bartholomew*, and of *Philip*. On this originally Gnostic basis, by expurgation or abbreviation of objectionable material, or by rewriting, yet using the same outlines, a series of Catholic Acts was produced, written from a more orthodox standpoint. A secondary form of the same literature is the so-called Abdias collection of *Martyrdoms* (*Passiones* and *Virtutes*) of the several apostles and their companions (Sixth Century). The most important and extensive of these *Acts* are *The Acts of John*, and *The Acts of Judas Thomas*, the Apostle to the Indians.

(c) Of Apocryphal Epistles, the most famous is the correspondence between Abgar, King of Edessa, and Jesus. Apocryphal Pauline epistles were: (1) An *Epistle to the Laodiceans*, on the basis of the hint in Col. iv. 16. (2) An *Epistle to the Alexandrians*, mentioned as early as c.170 A.D. (3) A *Third Epistle to the Corinthians*. These are simply compilations from the genuine Pauline letters in the New Testament. (4) Correspondence between Seneca and Paul in fourteen letters (at least as early as the Fourth Century).

(d) Apocryphal Apocalypses. Of these *The Apocalypse of Peter* is the most important, a small fragment of which was discovered with the fragment of the *Gospel of Peter*. The work was in existence as early as A.D. 175, and highly esteemed in some quarters. *The Apocalypse of Paul, The Vision of Paul, The Apocalypse of the Virgin Mary*, and other like works are late and less important.

(e) Didactic Works. *The Preaching* (Κήρυγμα) *of Peter* was written very early, possibly before A.D. 100. It was perhaps also known as the *Didascalia* or *Doctrine* of Peter. The existence of a *Preaching* (*Prædicatio*) *of Paul* is very doubtful. For other works sometimes classed as New Testament Apocrypha, see APOSTOLIC FATHERS; CLEMENTINA; BARNABAS, ACTS AND EPISTLE OF; HERMAS, SHEPHERD OF; REVELATION OF SAINT JOHN; TEACHING OF THE TWELVE APOSTLES.

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AP'OCYNA'CEÆ (Gk. ἀπό, *apo*, away from, + κύων, *kyōn*, dog). The DOGBANE FAMILY. An order of dicotyledonous plants, the species of which are herbs, shrubs, vines, and trees, mostly with a copious, milky juice. The leaves are mostly opposite, entire, and without stipules. The flowers are five-parted; ovary single and two-celled, or two and cone-celled. Fruit, a follicle or drupe; seeds with a straight embryo; endosperm small or none; seed often covered with a thistle-like down. There are about 130 genera and more than 1000 species in this order, the principal subdivisions of which are: ARDUINEÆ, represented by *Arduina* and *Landolphia;* PLUMERIEÆ, containing the tropical genus *Tabernæmontana,* and *Aspidiosperma, Vinca,* and *Alstonia;* and ECHITIDEÆ, which embraces *Kickxia, Apocynum, Nerium,* and *Strophanthus.* The properties of plants of this order vary greatly, but many are exceedingly poisonous. Some, like *Kickxia* and *Landolphia,* are rich in caoutchouc; *Apocynum* yields valuable bast fibre, and its rhizomes are used in medicine; *Strophanthus* contains in its seed a powerful poisonous alkaloid; while others have varied economic uses. See PERIWINKLE; OLEANDER; INDIAN HEMP; RUBBER; STROPHANTHUS; DOGBANE; WRIGHTIA; POISONOUS PLANTS, etc.

APOCYNUM, ȧ-pŏs′ĭ-nŭm. A genus of plants. See DOGBANE.

APOCYNUM, ȧ-pŏs′ĭ-nŭm. A drug composed of the powdered root of *Apocynum cannabinum,* Canadian or Indian hemp. Its taste is acrid and bitter. It contains apocynine, gallic and tannic acids, a bitter principle, etc. Its active ingredients are soluble in water and alcohol. Moderate doses increase the secretions of the skin, bronchi, and kidneys. Large doses cause vomiting and purging. The chief use of apocynum is as a diuretic. It may act directly as a renal stimulant and dilate the arterioles, but probably chiefly by increasing artificial pressure. It fails in many cases, but in others it causes marked increase of urine. See APOCYNACEÆ; DOGBANE.

APODES, ăp′ō-dēz (Gk. ἀ, *a,* priv. + πούς, *pous,* foot). An order of teleost fishes, variously limited, including the eels (not the electric eel), murænas, and allied serpentiform species. Consult T. Gill, *Standard Natural History,* III., 100 (Boston, 1885). See EEL.

AP′ODIC′TIC (Gk. ἀποδεικτικός, *apodeiktikos,* demonstrating, -ive). A logical term signifying necessary, and applied to judgments which admit of no contradiction. It is used largely by Kant. See A PRIORI.

APOG′AMY (Gk. ἀπό, *apo,* away from + γάμος, *gamos,* a wedding). A name which refers to the fact that a plant which ordinarily comes from a fertilized egg may, under certain conditions, develop in some other way. It is a general term, used to cover all cases in which the asexual plant does not come from a fertilized egg, without reference to the method of its origin. 'Parthenogenesis' is that form of apogamy in which a plant is developed from an egg that has not been fertilized. In other cases of apogamy the new plant is developed in a vegetative way from various other tissues. The phenomenon of apogamy has been observed chiefly among the ferns, which seem to respond most readily to the conditions which favor it. Numerous cases have now been observed (both among native and cultivated forms), in which the leafy plant arises in various ways directly from the prothallium, without the fertilization or even production of an egg. Among the mosses apogamy has never been observed; that is, there is no reason to believe that the spore-bearing structure ever has any other origin than a fertilized egg. Among the seed-plants the phenomenon has been recorded in a number of cases, and has usually been wrongly referred to parthenogenesis. So far as the records go, true parthenogenesis has been established in seed-plants only for Antennaria and Alchemilla, genera of Compositæ, and for Thalictrum, a genus of Ranunculaceæ. In various other cases, however, in which embryos are known to arise in seeds which have received nothing from the pollen, it is discovered that the embryo is not developed by the unfertilized egg, but arises vegetatively from various tissues of the ovule, just as a bud may develop almost anywhere upon a plant. The fact that a seed contains an embryo is not sure indication that this embryo has developed from the egg. In seed-plants, therefore, the extent of the phenomenon of apogamy is uncertain and difficult to determine.

AP′OGEE (Gk. ἀπό, *apo,* from, + γῆ, *ge,* the earth). When the earth and some other planet reach such positions in their respective orbits that the distance between them is a maximum, then that planet is said to be in its apogee. The use of the word apogee is usually restricted to the sun and moon, the sun's apogee corresponding to the earth's aphelion, and the moon's apogee being the point of its orbit most remote from the earth. Apogee is opposed to perigee.

AP′OGEOT′ROPISM, or NEGATIVE GEOTROPISM. That form of sensitiveness to gravity in plants by virtue of which organs tend to grow vertically upward—that is, in a direction opposite to that of the earth's attraction. The best example of this phenomenon is found in the main shoots of most plants. When 'centrifugal force' is brought to bear upon the plant in place of gravity, the stems of seedlings grow toward the centre of revolution, while the roots, being positively geotropic, grow in the opposite direction. See GEOTROPISM IN PLANTS.

APOLDA, ȧ-pōl′dȧ. A town of the Grand Duchy of Saxe-Weimar, Germany, near the Ilm, a feeder of the Saale, eight miles northeast of Weimar (Map: Germany, D 3). It is a station on the Thuringian Railway, between Weimar and Weissenfels. It is a place of much industrial activity, having extensive manufactures of hosiery and woven goods. Population, in 1895, 20,798; in 1900, 20,352; in 1905, 21,262.

APOL′LINA′RIS (? -392). The younger, bishop of Laodicea in Syria, and one of the warmest opponents of Arianism. Both as a man and a scholar he was held in the greatest reverence, and his writings were extensively read in his own day. His father, Apollinaris the elder, who was Bishop of Laodicea, was born at Alexandria, and taught grammar, first at Berytus, and afterward at Laodicea. When Julian prohibited the Christians from teaching the classics, the father and son endeavored to supply the loss by converting the Scriptures into a body of poetry, rhetoric, and philosophy. The Old Testament was selected as the subject for poetical compositions after the manner of Homer, Pindar, and the tragedians; while the New Testament formed the groundwork of dialogues in imitation of Plato. It is not ascertained what share the father had in this work; but as he had a reputation for poetry, he probably put the Old Testament into Greek verse. But it was chiefly as a controversial theologian, and as the founder of a sect, that Apollinaris is celebrated. He maintained that the *logos*, or divine nature in Christ, took the place of the rational human soul or mind, and that the body of Christ was a spiritualized and glorified form of humanity. This doctrine was condemned by several synods, especially by the Council of Constantinople (381), on the ground that it denied the true human nature of Christ. The heresy styled Apollinarianism spread rapidly through Syria, and neighboring countries, and, after the death of Apollinaris, its adherents formed two sects—the Vitalians, named after Vitalis, bishop of Antioch, and the Polemeans, after Polemo, who added to the doctrine of Apollinaris the assertion that the divine and human natures were so blended as one substance in Christ that his body was a proper object of adoration. On this account they were accused of *sarcolatria* (worship of the flesh) and *anthropolatria* (worship of man), and also were styled *synousiastoi* (*σύν*, *syn*, together, *οὐσία*, *ousia*, substance), because they confused the two distinct substances. Other leaders were Valentinus and Timothy.

APOLLINARIS, Saint. A citizen of Antioch, founder and bishop of the Church of Ravenna. He followed Saint Peter to Rome, where he was ordained. As late as the Ninth Century, indentations on a certain rock at the Elm Monastery at Rome were said to have been the impressions left by the heads, backs, and legs of the two saints during a night spent there in sleep.

APOLLINARIS SIDO'NIUS (430-487). A Roman author, political leader, and Bishop of Arverna (Clermont-Ferrand), born at Lyons. He married in about 452 the daughter of Avitus, who was Emperor from 455 to 456. He was prefect of Rome in 468, bishop in 472, and headed the national party against the Goths. In 474 he was imprisoned. After his death he was canonized. He wrote nine books of letters, of great historical value, and twenty-four poems, mainly panegyrical. The best edition of his work is in the *Auctorum Antiquissimorum*, Vol. VIII., in the *Monumenta Germaniæ Historica* (Berlin, 1887). Consult Hodgkin, *Italy and Her Invaders*, Vol. II. (Oxford, 1892).

APOLLINARIS WA'TER. An alkaline mineral water obtained from a spring in the valley of the Ahr, in Rhenish Prussia, which was discovered in 1851. Its pleasant taste and richness in carbon dioxide gas make it a valuable table water that is recommended for dyspepsia and loss of appetite.

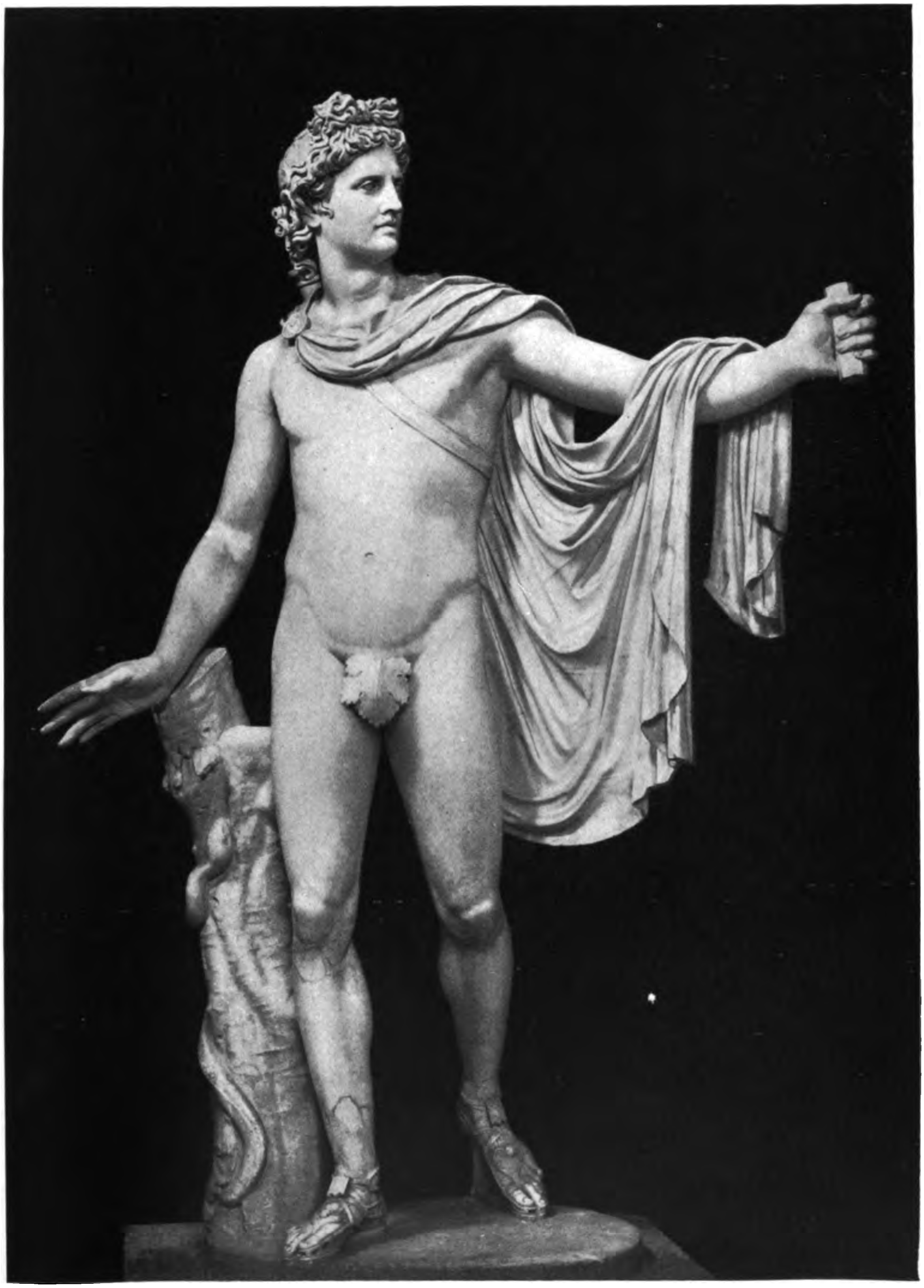
Its composition is:

Sodium carbonate	6.964	grains in	a pint
Magnesium "	2.751	"	"
Calcium "	1.900	"	"
Sodium chloride	2.743	"	"
Sodium sulphate	1.548	"	"
Sodium phosphate Potassium salts	Traces.		
Iron oxide with alumina	0.049	"	"
Silicic acid	0.099	"	"
Carbonic acid (free and semi-combined)	42.81	cub. in. in	a pint
Carbonic acid (combined)	12.44	"	"

APOL'LO. A borough in Armstrong County, Pa., 28 miles northeast of Pittsburg in a direct line, on the Kiskiminetas River, and on the West Penn. Division of the Pennsylvania Railroad (Map: Pennsylvania, B 3). It is the centre of a coal mining region and manufactures steel, fire brick, barrels, etc. Apollo was settled in 1790, laid out in 1816, and incorporated as a borough in 1848. Population in 1890, 2156; in 1900, 2924.

APOLLO (Gr. Ἀπόλλων Apollōn, Doric for Ἀπέλλων, *Apellōn*). Next to Zeus, the most important and widely worshiped divinity of Greece. Later antiquity identified Apollo with the sun, but in Homer the two are entirely distinct. As to the origin and meaning of the name Apollo, there is no general agreement among scholars, though the weight of argument is slightly in favor of those who interpret it as from "he who wards off" or "drives away" evil, from which conception it is easy to explain many of the varied forms of the Apollo cult. Thus Apollo is a god of healing for diseases, and of purification from moral defilement. So he was said to have purified Orestes for the murder of his mother, and so he was invoked to purify and cleanse entire communities afflicted by pestilence. In the same way his protection was extended to flocks and herds, as is shown by his epithet *Nomios*, and the story of his serving as the shepherd of Admetus, to the great increase of the flocks of that king. He also appears as protecting the grain from mildew, and as driving away field-mice, whence his surname *Smintheus*. There are also traces of Apollo as a war god, who can drive away the enemy, and who mingles actively in the fray; and at the shrine in Amyclæ, he appeared with a helmet and lance. Nor is this view of the original conception of Apollo in any way inconsistent with his very obvious connection with the light. For that he was early connected with the sun is clear, from the celebration of his departure in the autumn to a distant land, and his return in the spring. Light is regarded as a healer and protector, the bane of evil spirits who love darkness. The light and heat, however, are not always beneficent, and Apollo thus appears as the sender of pestilence, and as bringing sudden death with his unerring arrows. As a light-god, also, he is called Lycean and Lycian; these terms are probably connected with the Latin *lux*, light. The ancients connected these epithets with the Greek word for 'wolf' (λύκος, *lykos*), and some good modern authorities consider Apollo as originally a herdsman's divinity in the form of a wolf. He is also styled Phœbus (Φοῖβος), the "bright one," the "brilliant one." Whatever may have been his early nature, the prominent conception of Apollo in historic times was as a god of prophecy, and so of music and song. His most famous oracle was at Delphi (q. v.), but there were others at Delos; at the Ismenian sanctuary near Thebes; at Abæ, on the border of Phocis; at Patara, in Lycia; and at Claros, in Ionia, near Colophon. Apollo was also a god of colonization, and many Greek cities believed that their founders had been guided by Apollo in the form of an animal or bird.

As is natural in the case of a god so widely worshiped, the legends of Apollo are highly diversified, though the main features show considerable unity, due to the overpowering influence of the cults at Delphi and Delos, which made their versions canonical. He was the son of Zeus and Leto (Latona), born with his twin sister Artemis (see Diana) on the island of Delos, which had hitherto floated on the sea, but



APOLLO BELVEDERE
IN THE BELVEDERE OF THE VATICAN

now became fixed, and afforded a refuge for Leto, who had been driven from all other places by the wrath of Hera. After his birth, the god hastened to Delphi and slew the dragon Python, who had pursued his mother during her sorrow. For other legends see ADMETUS; HYPERBOREANS; LAOMEDON; NIOBE. In Greece, Apollo was not the god of any single race. The Ionians worshiped him as the ancestral god, Patroös, while the great Dorian festival, Carneia (see GREEK FESTIVALS), was held in his honor. In Rome, his worship was introduced from Greece at a comparatively late date. The earliest mention of a place of worship for Apollo is in B.C. 449, and it was not till B.C. 212 that the *Ludi Apollinares* were celebrated. Augustus greatly increased the honor of the god in gratitude for the victory of Actium, and built him a splendid temple on the Palatine, with which a library was connected. The temple contained the celebrated statue by Scopas.

The representations of Apollo in ancient art are almost innumerable. As Apollo Agyieus, he was worshiped in the form of a conical stone. In general, two chief types can be distinguished. As a nude youth, the ideal of youthful strength and beauty. This can be traced from the rude statues of archaic art, of Melos, Thera, and Orchomenus, through the Payne-Knight bronze, and the Choiseul-Gouffier marble in the British Museum, to the almost effeminate type of the Apollo Sauroctonos (the lizard-slayer) of Praxiteles, or the glorious divinity of the Apollo of the altar frieze from Pergamon (q.v.). The other type represents the god as clad in the long robe of the musician playing on the lyre, as he appears in the statue in the Vatican, which is probably a copy of the work of Scopas. The special attributes of Apollo are the bow and quiver, the laurel and the lyre. Consult: Overbeck, *Griechische Kunstmythologie* (Leipzig, 1871-89); and Wernicke in the Pauly-Wissowa *Realencyklopädie der klassischen Altertumswissenschaft* (Stuttgart, 1900).

APOLLO BELVEDERE, bĕl'vâ-dā'râ. A celebrated statue of antiquity, probably found at Grotto Ferrata (or possibly at Porto d'Anzio), and in 1503 placed in the Belvedere of the Vatican by Pope Julius II. The left hand and right forearm were restored by Montorsoli, a pupil of Michelangelo. The right hand originally held a laurel branch wound with fillets, while the presence of the quiver shows that the left raised the bow. The ægis, which has been restored in the left hand, on the evidence of a bronze statuette, is not known as an attribute of Apollo, nor is its presence in the statuette proved. The beautiful face expresses divine wrath and contempt. The god, clad only in the chlamys (q.v.), is moving forward against the powers of evil to rescue the distressed. This statue was once regarded as the highest type of Greek art, but it has long been known to be only a careful Roman copy of a Greek original, which cannot well be earlier than the latter part of the Fourth Century B.C. (possibly by Leochares), while many good authorities regard it as belonging to the Third, or even Second Century B.C.

APOLLO CITH'ARŒ'DUS (Gk. *κιθαρῳδός, kitharōdos*, harper, from *κιθάρα, kithara*, lyre + *ἀοιδός, aoidos*, singer). Apollo, in his function of God of Music. Two famous statues of him in this capacity are in existence: one at the Vatican, the other at the Munich Glyptothek, both of uncertain date and origin.

APOLLO CLUB. A Seventeenth-Century literary *coterie*, resembling the Elizabethans' 'Areopagus,' or that still more famous gathering which, in the Eighteenth Century, surrounded Dr. Johnson. Among its members were Ben Jonson, Robert Herrick, Randolph, and other poets and pamphleteers. Its meeting-place was the Devil Tavern at Temple Bar.

AP'OLLODO'RUS (Gk. Ἀπολλόδωρος, *Apollodōros*). (1) An Athenian painter of the Fifth Century B.C., an elder contemporary of Zeuxis. He is said to have introduced the rendering of light and shade in place of the flat coloring of his predecessors. (2) A celebrated architect of the early part of the Second Century, A.D., employed by the Emperor Trajan in the construction of his bridge over the Danube, in that of the Forum called the Forum of Trajan, and other works in Rome. His severe censure of Emperor Hadrian's plans is said to have caused Apollodorus's banishment and death. (3) A Greek grammarian of the Second Century B.C. He studied philosophy in his native Athens, and then joined the Alexandrian scholars about Aristarchus; wrote a chronicle in iambic verse and several grammatical works. His greatest work was *On the Gods*, apparently a history of the Greek religion, though its exact nature can only be conjectured from scattered notices. The mythographical handbook which began with the origin of the gods, and ended with the story of Troy, though it bears the name of Apollodorus, is certainly a compilation of a later date.

AP'OLLO'NIA (Gk. Ἀπολλωνία). The name of more than thirty ancient cities. (1) In Illyria, on the Aoüs, founded by emigrants from Corinth and Corcyra, commercially prosperous, and towards the end of the Roman Empire a seat of literature and philosophy. (2) In Thracia (afterwards Sozopolis, and now Sizeboli), colonized by Milesians, and famous for a colossal statue of Apollo, by Calamis, which was removed to Rome. (3) The port of Cyrene (afterwards Sozusa, and now Marsa Suza), which outgrew Cyrene itself, and left evidences of its magnificence in the ruins of its public buildings. (4) A city of Macedonia, referred to in Acts xvii. 1 as one of the stations on the road from Amphipolis to Thessalonica. Its exact position is not known. It was, doubtless, on the celebrated Via Egnatia, probably south of and near to the present Gol (Lake) Beshik. Little is known of its history.

AP'OLLO'NIUS (Gk. Ἀπολλώνιος, *Apollōnios*). An Alexandrian scholar, son of Archibius. He lived toward the end of the First Century A.D., and compiled a lexicon of Homeric words, the main sources of which were Apion's *Glossary*, and the commentaries of Aristarchus and Heliodorus. Though it has come down to us in abridged and otherwise imperfect form, this work is valuable for the exegetical study of Homer.

APOLLONIUS, OF PERGA. A mathematician and younger contemporary of Archimedes and Eratosthenes. Born at Perga, in Pamphylia, he lived, during the years of his activity as a scholar, which were approximately from B.C. 247

to 205, at Alexandria and Pergamum. His principal work was a treatise on Conic Sections, in eight books, the first four of which, accompanied by a sixth-century commentary on same by Eutocius, have come down to us in the original Greek. Books I.-VII. were twice translated into Arabic in the Ninth and Tenth centuries, and from one of these Arabic translations there is a Latin translation of Books V.-VII. Of Book VIII. there exist only certain *lemmata* of Pappus, dating from the Third and Fourth centuries A.D. This work, containing four hundred problems, was so complete that it left little for his successors to improve. He wrote on the methods of arithmetic calculation, on statics, the stations and regressions of the planets (a work upon which Ptolemy drew in writing the *Almagest*), and on transversals of conics, which laid the foundation for the geometry of position. Among his other works deserving mention are: *De Sectione Spatrii*, *De Sectione Determinata*, and *De Tractionibus*. Apollonius's problem, "To draw a circle tangent to three given circles in a plane," found in his treatise on *Contact*, has been solved by Newton, Vieta, and others. Consult: Halley, *Opera et Studia* (Oxford, 1810), which is the best edition of the extant works of Apollonius; Heisberg, *Apollonii Pergœi quœ Grœce Exstant Opera* (Leipzig, 1891-93). T. L. Heath's Cambridge edition also deserves mention.

APOLLONIUS, of Tyana. A native of Tyana, in Cappadocia, who lived in the time of Christ. He was a zealous follower of the doctrines of Pythagoras. He traveled through Asia to Nineveh and Babylon, thence to India, where, at the court of King Phraortes, he met Jarchas, the principal Brahmin. When Apollonius returned from this pilgrimage, his fame as a wise man was greatly increased; the people regarded him as a worker of miracles and a divine being, and princes were glad to entertain him at their courts. He himself seems to have claimed insight into futurity, rather than the power of working miracles. Yet in Rome it was claimed that he raised a young woman from the dead. He was acquitted of treason by Nero, because the indictment had vanished from the paper. After extensive travels in Spain, Italy, Greece, and Ethiopia, he was accused of having taken part in an insurrection against Domitian. He appeared before the tribunal, but soon miraculously vanished. Ultimately, he appears to have settled in Ephesus, where he opened a Pythagorean school, and continued his teaching until he died, nearly one hundred years old. His history was written by Philostratus (q.v.), but is plainly a religious novel intended for the entertainment of Julia, wife of the Emperor Severus, who, however, died ere its completion. The travels of the Apostle Paul are a more likely inspiration to this work than the Gospel narrative of Christ. It contains a mass of absurdities and fables, through which an outline of historical facts and the real character of the man are sufficiently discernible. Hierocles, a heathen statesman and opponent of Christianity, wrote, in the Third Century, a work on the life and doctrines of Apollonius, with a view to prove their superiority to the doctrine of Christ. In modern times, the notorious English freethinker Blount, and Voltaire in France, have renewed the attempt. Consult: B. L. Gildersleeve, *Essays and Studies* (New York, 1890), and L. Dyer, *Studies of the Gods in Greece* (New York, 1894); and for his life, Philostratus in the Teubner series, Vol. I. (Leipzig, 1870-71); English trans., Guthrie (New York, 1905); French trans., A. Chassang (Paris, 1862); German trans., E. Baltzer (Rudolstadt, 1883); also the essay of F. C. Baur, "Apollonius von Tyana und Christus", in *Drei Abhandlungen* (ed. Zeller, Leipzig, 1876); O. de B. Priaulx, *The Indian Travels of Apollonius of Tyana* (London, 1873); D. M. Tredwell, *A Sketch of the Life of Apollonius of Tyana* (New York, 1886); G. R. S. Mead, *Apollonius of Tyana* (London, 1901).

APOLLONIUS, of Tyre. The hero of a Greek romance now lost, which in a Latin version enjoyed great popularity in the Middle Ages, and was translated into almost all the languages of Western Europe. In it are related the romantic adventures which befell Apollonius, a Syrian prince, previous to his marriage with the daughter of King Alcistrates, of Cyrene. To these are added the adventures of his wife, who was parted from him by apparent death, as well as those of his daughter, Tarsia, who was carried off by pirates and sold in Mytilene. The work closes with the reunion of the whole family. The original Greek work belonged to the Third Century A.D., and showed close relations with the *Ephesiaca* of Xenophon of Ephesus. The Latin version was made by a Christian, not earlier than the Fifth Century. The account given in the *Gesta Romanorum* and the part contained in the *Pantheon* of Godfrey of Viterbo (c.1185) are drawn from this early translation. The earliest translation from the Latin was into Anglo-Saxon in the Ninth and Tenth centuries; an early English rhymed version of the end of the Fourteenth Century is to be found in Gower's *Confessio Amantis*; and the materials are employed in Shakespeare's *Pericles*. About 1300, Heinrich von der Neuenstadt produced a poetical version in over twenty thousand verses, based probably on the account in the *Gesta Romanorum*. The *Histori des Küniges Apollonii*, published 1476, is translated from Godfrey of Viterbo, as is the Spanish version of the Thirteenth Century, printed in Sanchez's *Colección de Poesias Castellanas* (Paris, 1842). Several French and Italian versions have been made from the same source. There are also middle and modern Greek versions extant. The Latin translation from the Greek original is edited by Riese, *Historia Apollonii Regis Tyri* (2d ed. Leipzig, 1893). Consult in general: Rohde, *Der griechische Roman und seine Vorläufer* (Leipzig, 1900); Hagen, *Der Roman vom König Apollonius in seinen verschiedenen Bearbeitungen* (Berlin, 1878); Simrock, *Quellen des Shakespeare* (Bonn, 1872).

APOLLONIUS DYS'COLUS (Gk. *'Απολλώνιος Δύσκολος*, *Apollōnios Dyskolos*). An Alexandrian scholar who lived in the first half of the Second Century A.D. He and his son, Herodian, were the first and the greatest of Greek grammarians. Apollonius reduced grammar to a system and made a science of syntax, and among the later grammarians be passed as an authority on questions of syntax, and the theoretical part of grammar. He wrote a large number of works, but the greater portion of them perished early. There are extant four: those on *Pronouns*, on *Conjunctions*, on *Adverbs*, and on the *Syntax of the Parts of Speech*. It is not clear whether the surname *Dyscolus* (the 'crabbed') had reference to his literary style or to his disposition of mind.

APOLLONIUS MO′LON. A Greek rhetorician, born at Alabanda, in Caria. He taught rhetoric at Rhodes, and was a distinguished pleader in the courts of justice. In B.C. 81, being sent to Rome as an ambassador by the Rhodians, he addressed the Roman Senate in Greek. He stayed some time at Rome, and was there heard by Cicero, who afterwards (B.C. 78) visited him at Rhodes. Other distinguished Romans, among them Cæsar, also attended his lectures.

APOLLONIUS RHO′DIUS (c.295-c.215 B.C.). An epic poet, son of Silleus (or Illeus), born at Alexandria. As a youth he was the pupil of Callimachus, but afterwards entered into a bitter strife with his former teacher, on literary grounds. Callimachus was the champion of the short poem in the artificial and learned style, while Apollonius preferred the lengthy poem in the simple style of Homer. The *Argonautica*, the most important and only extant poem of Apollonius, was in part written while the author was at Alexandria, and was received with scorn by the audience there. Apollonius then withdrew to Rhodes, revised his poem, and produced it with great acclaim. He received citizenship at Rhodes, set up a school of rhetoric there, and styled himself the *Rhodian*. Later in life he is said to have returned to Alexandria, and to have succeeded Eratosthenes as librarian—an office which he held till his death. The *Argonautica* is an epic poem in four books, containing an account of the expedition of the Argonauts in quest of the Golden Fleece. The first two books describe the departure of the expedition and the adventures on the way; the third book tells of the passion of Medea; the fourth book gives an account of the return home. The poem imitates the language and style of Homer, but it is labored and lacks spirit and movement. The *Argonautica* was much admired by the Romans, being translated at least once, and often imitated by them. Apollonius wrote other works in verse and in prose. Critical edition by Merkel (1854).

APOL′LOS (Gk. 'Απολλώς, an abbreviation of Απολλώνιος, *Apollonios*). An early Christian missionary and companion of Saint Paul. He was an Alexandrian, converted probably in Alexandria by followers of John the Baptist, and at once threw himself with enthusiasm into the work of propagating the new faith. He came to Ephesus, and there gladly accepted the fuller instruction which he received from Priscilla and Aquila. Thus equipped, he passed on to Corinth, where he labored with great success (Acts xviii. 24-28). But unhappily, there were those there who made a party called by his name, and so contributed to the factional troubles in the Corinthian Church. From Corinth he went to Ephesus. But his Corinthian admirers, who preferred his more rhetorical manner of preaching to the simpler manner of Paul, desired his return, and he promised to come a little later (I. Cor. i. 10-12; iii. 4-6; xvi. 12). The last mention of him in the New Testament (Titus iii. 13) shows him about to undertake a journey to Crete. According to tradition he became the first bishop of Crete.

APOLLO SAUROC′TONOS (Lizard-killer). A statue of the youthful Apollo in the Vatican —a copy of a bronze of Praxiteles. It represents the god leaning against a tree, on the point of stabbing a lizard with a dart as the reptile crawls up the trunk.

APOLLYON, à-pŏl′lĭ-on *or* à-pŏl′yŭn (Gk. Απολλύων, from ἀπολλύναι, *apollynai*, to destroy). A designation used (Rev. ix. 3-11) to translate the Hebrew *Abaddon*, which means destruction, and which was one of the names given to the great gathering place of the dead, more commonly known as Sheol. Apollyon is personified as the angel having dominion over the locusts coming up out of the 'bottomless pit' at the sound of the fifth trumpet on the day of judgment. In the Apocrypha (Tobit iii. 8) the slayer of the seven husbands of Sarah, daughter of Raguel, is called Asmodeus, who is by some critics identified with Abaddon, or Apollyon. In Talmudic literature (Treatise *Shabbath* 55^a). Abaddon is the name given to the angel who with Maweth, i.e. 'death,' stands over the six angels of destruction, who aid God in the punishment of the wicked.

AP′OLO′GIA PRO VI′TA SU′A (Lat., defense concerning his life). John Henry (afterwards Cardinal) Newman's defense of his position in the "Oxford movement." Its immediate cause was an accusation made by Charles Kingsley, that, "Truth for its own sake has never been a virtue with the Roman clergy. Father Newman informs us that it need not and, on the whole, ought not to be." Newman first demanded a substantiation or a retraction of this charge; and, unable to obtain either, published the *Apologia*.

APOL′OGIE FOR PO′ETRY. A famous work written by Sir Philip Sidney in 1580, and published in 1595, in answer to an attack on the playhouses entitled *The School of Abuse*, dedicated to him without his consent, by Stephen Gosson. It is a defense and eulogy of the art of poetry, closely modeled after Aristotle's *Poetics*, and couched in the exaggerated Elizabethan style.

AP′OLOGUE (Gk. ἀπόλογος, *apologos*). A fable, parable, or short story, intended to serve as a pleasant vehicle of some moral doctrine. One of the oldest and best apologues or parables is that by Jotham, as given in the book of Judges (ix. 7-15). Another celebrated apologue is that of the "belly and the members," related by the patrician Menenius Agrippa. Æsop's fables have enjoyed a world-wide reputation. Luther held such an opinion of the value of the apologue as a vehicle of moral truth, that he edited a revised *Æsop*, for which he wrote a characteristic preface. He says: "In doing this, I have especially cared for young people, that they may receive instruction in a style suitable to their age, which is naturally fond of all kinds of fiction; and I have wished to gratify this natural taste without indulging anything that is bad." Consult Jacobs, Introduction to the *Fables of Æsop* (New York, 1896).

APOL′OGY (Gk. ἀπολογία, *apologia*, a speech in defense, defense). A term now commonly understood as synonymous with an excuse for breach of an engagement, etc., but originally used as the title of any work written in defense of certain doctrines, as in the *Apology of Socrates*, ascribed to Plato and Xenophon; the *Apology for the Christians*, by Tertullian, and in many other defenses of the Christians, written by Justin Martyr, Aristides, Athenagoras, Tatian, Theophilus, Origen, Eusebius, Minucius Felix, Arnobius, Lactantius, Augustine, Orosius, and others. The attacks parried or retorted in these apologetical works are such as charges of atheism, want of philosophical knowledge, anti-social tenets, etc. Both the charges and the refutations brought forward serve to give us an insight into the character of the times when these works were written. Thus, in the Apology by Tertullian, it is curious to find a formal argument employed to refute the assertion that the spread of Christianity was the cause of "earthquakes" and other natural phenomena which had occurred in some parts of the Roman Empire. After the Fourth Century, when the Church was made dominant under the Roman Emperors, apologetical writings were less called for; but Bartholus Edessenus and Raymundus Martinus wrote against the Jews and the Mohammedans. In the Fifteenth Century, when the revival of learning placed Christianity in apparent opposition to the Platonic philosophy, Marsilius Ficinus wrote in defense of revelation; and, some time after the Reformation, the spread of freethinking and skepticism in England was opposed by a variety of apologetical works, chiefly maintaining the points that Christianity is a divine revelation, Christ a divine Messenger, and His Church a divine institution. The defense of Christianity on grounds of reason came now to be treated as a distinct branch of theology, under the name of *Apologetics*. Among the numerous apologetic works by Protestants may be mentioned those by Grotius *(De Veritate, etc.)*, Butler *(Analogy of Religion, Natural and Revealed)*, Lardner (*Credibility of the Gospel History*), Leland, Addison, Soame Jenyns *(Internal Evidences of the Christian Religion)*, Hugh Farmer, Bishop Watson (*Apology for Christianity*), Paley (*Evidences of Christianity*, and *Horæ Paulinæ*). Among Roman Catholic apologetic writers the most eminent are Pascal, Houteville, Guenée, Bergier, Mayr, and Chateaubriand.

In the Nineteenth Century a great number of apologetic works by Neander, Tholuck, and others were called forth in reply to Strauss's *Das Leben Jesu* and the *Vie de Jésus* by Joseph Ernest Renan. Later came the attacks from agnostic, materalistic, and other philosopho-scientific sources, and these have been replied to by Christian scholars, as A. Ebraid, *Apologetics*, second edition (Gütersloh, 1878-80); English translations, three volumes (Edinburgh, 1886-87); P. Schanz (Catholic) (Freiburg, 1895-98); English translations, three volumes (Dublin, 1897); A. B. Bruce, *Apologetics* (New York, 1892). Manifestly these works are written to meet a passing need, and few of them retain much value after a few years.

AP'OMOR'PHINE (Gk. *ἀπό*, *apo*, away from + *morphine*). An artificial alkaloid made by heating morphine with hydrochloric acid under pressure. The salt of apomorphine employed in medicine is the hydrochlorate, which occurs in fine whitish, needle-shaped crystals that rapidly absorb moisture from the air, becoming green. It is the best-known of the so-called systemic emetics (see EMETIC), and causes vomiting promptly, within five to twenty minutes, whether given by mouth or hypodermically. This emesis is due to direct action on the vomiting centre in the medulla. It is repeated frequently, with little nausea, after the stomach has been emptied, and is accompanied by marked muscular relaxation. The respiration and circulation are also depressed, and large doses may cause convulsions, followed by paralysis. As an emetic it is used when sudden action is desired or when swallowing is difficult or impossible. It is used also in small doses as a sedative expectorant. Furthermore, apomorphine has been recommended as a hypnotic, and is said to act usually within ten or fifteen minutes. For this purpose a small dose is given hypodermically after lying down. If the patient moves about after taking it, vomiting is said to be likely to occur.

AP'ONEURO'SIS (Gk. *ἀπονεύρωσις*, end of a muscle where it becomes tendon, from *ἀπό*, *apo*, away + *νεῦρον*, *neuron*, sinew, tendon). An anatomical term for a sheet-like expansion of strong fibrous tissue, of which there are many examples in the human body. For the sake of convenience, it is generally confined to expansions from the tendons of muscles, as the lumbar aponeurosis. If a tendon is very broad and expanded, as that of the external oblique muscle of the abdomen, it is said to be aponeurotic. Some muscles, as those on the shoulder-blade, are partially covered with a tendinous expansion, to which some of their fibres are attached; this is termed the aponeurotic origin of the muscle; it gives the muscle a more extensive attachment, without adding materially to weight.

APOPH'YLLITE (Gk. *ἀπό*, *apo*, away + *φύλλον*, *phyllon*, leaf). A common mineral of the zeolite group. It is a hydrated potassium-calcium silicate crystallizing in tetragonal forms. The lustre is vitreous except on cleavages parallel to the basal pinacoid, which show a pearly lustre. It is colorless, white, pink, or greenish. Apophyllite occurs as a secondary mineral in basalt and other volcanic rocks. Excellent specimens are found in the United States at Bergen Hill, N. J., and throughout the Lake Superior region, as well as in Greenland, Mexico, the Harz region, and Nova Scotia. It is named from its tendency to exfoliate under the blowpipe.

AP'OPLEXY (Gk. *ἀποπληξία*, *apoplēxia*, from *ἀπό*, away + *πλήσσειν*, *plēssein*, to strike). A term applied to an engorgement of blood, with or without extravasation, in or upon any organ, as the brain (*cerebral apoplexy*), the spinal cord or lungs (*pulmonary apoplexy*). As popularly used, the term denotes vaguely a condition arising from some disturbance of the brain circulation. In medicine three distinct affections of the brain circulation are understood: cerebral *embolism*, cerebral *thrombosis*, and cerebral *hemorrhage*. These differ in their cause and somewhat in their symptoms. In cerebral *embolism* there is a sudden blocking up of one of the blood vessels of the brain by some foreign body in the circulating blood. Such foreign bodies frequently come from diseases of the joints or pleuræ, or sometimes from the placenta in pregnant women; but more often from the valves of the heart, which in a number of septic diseases, as rheumatism, typhoid, gonorrhea, etc., have minute growths upon them. These become detached, and are swept into the circulation, and may block up a brain artery.

The symptoms come on acutely, may occur in the young or old, and may be slight, if a small vessel is blocked, or severe if the vessel is large. There may be sudden dizziness and weakness, going on to slight convulsive movements of one side of the body and loss of consciousness. This is accompanied by deep, noisy breathing, a slowing of the pulse, and perhaps a slight rise in temperature. The person may soon recover, usually with some weakness in some part of the body, or with a slight paralysis of some of the muscles of the leg, arm, or face. At times the whole of one side of the body may remain paralyzed.

Cerebral thrombosis is due to a disease of the blood vessels themselves, during which blood clots may form in them, and thus cut off a portion of the brain substance from its normal supply of blood. Syphilis is the chief cause, especially in most cases of apoplexy under forty years of age. The symptoms are apt to come on more gradually. Following a week of headache, dizziness, and nausea, may occur peculiar sensations of prickling in the fingers; convulsive movements in some of the muscles, and twitchings or gradually increasing lameness, or loss of muscular strength. At the time of attack the symptoms resemble those of embolism.

Cerebral hemorrhage is the most important cause of apoplexy. It occurs from the rupture of a blood vessel in the brain substance, and the severity of the symptoms depends partly on the amount of the hemorrhage, largely on the part of the brain involved. Hemorrhage is more apt to occur in the aged, and it is a frequent cause of death in those over sixty years of age. The symptoms may be sudden and terminate in death, or there may be several attacks of giddiness or collapse, with tingling or twitchings of the extremities, loss of speech, etc. Patients may have several attacks and yet recover, with some persisting paralysis of one side of the body or of one arm or one leg. Little can be done before a physician comes. Mustard baths to the feet and the application of heat to the extremities may help in some cases. Persons with the "apoplectic habit" should take special care not to become mentally disturbed.

APOPLEXY, Parturient. See Milk Fever.

APORT'. See Helm.

APOS'PORY (Gk. *ἀπό*, *apo*, away, from + *σπόρος*, *sporos*, seed). A name which literally means "without spore reproduction," and which refers to the fact that in some cases the sexual plant develops directly from an asexual one without the intervention of a spore. This phenomenon, like its correlative, *Apogamy* (q.v.), has been especially observed among ferns, and the list of known forms which show it is increasing rapidly. Under certain conditions, which are not clear, a prothallium (the sexual plant) buds directly from various regions of the fern leaf, common among which are abortive sporangia and leaf teeth. Among mosses, cases of apospory have been observed, and have also been induced artificially. In these cases a sexual plant is developed directly from the spore-bearing structure. Among seed-plants apospory has not been observed, and in the very nature of things is not likely to be found, one reason for this being that the sexual plant is so very much reduced that it would hardly be observable, even if it were to appear vegetatively.

APOS'TATE (Gk. *ἀποστάτης*, *apostatês*, deserter, renegade, from *ἀπό*, *apo*, away + *ἱστάναι*, *histanai*, to place, to stand). Literally, any one who changes his religion, whatever may be his motive; but, by custom, a word always used in an opprobrious sense, as equivalent to renegade, or one who, in changing his creed, is actuated by unworthy motives. In early Christian times, the word was applied to those who abandoned their faith in order to escape from persecution (see Lapsed); but it was also applied to such as rejected Christianity on speculative grounds, as, for instance (though in his case there had been no intelligent reception of Christianity), the Emperor Julian was supposed to have done. After the Fifth Century, when heathenism was declining, many who had no sincere belief in Christianity, yet made profession of it and were baptized; these also were styled apostates. The Roman Catholic Church at one period imposed severe penalties on apostasy. The apostate was, of course, excommunicated, but sometimes, also, his property was confiscated, and he himself banished, or even put to death. It has often been of great moment to the fortunes of a nation that a prince has changed his religion. The most renowned instance in modern history is that of Henry IV. of France. Those who embrace a religious faith are called 'converts' by those they join and 'perverts' by those they leave. The term Apostasy is now employed commonly, and often abusively, as a reproach for great or sudden changes in political opinions.

A POSTE'RIO'RI. See A Priori.

APOS'TLE (Gk. *ἀπόστολος*, *apostolos*, one sent forth, a delegate, from *ἀπό*, *apo*, from + *στέλλειν*, *stellein*, to send). The name used in the New Testament to designate specifically that group of Christ's disciples who were called by Him to be His more intimate companions during His ministry, and to proclaim, as His representatives, the Gospel to men. They were twelve in number: Simon Peter (Hebrew name Cephas), Andrew, James (the son of Zebedee), John (brother of James), Philip, Bartholomew, Matthew (Hebrew name Levi), Thomas (also called Didymus), James (the son of Alphæus), Jude (the son of James, doubtless to be identified with Thaddæus, named in his place in the lists of Matthew and Mark), Simon (the Canaanite, also called the Zealot), and Judas Iscariot.

Their qualifications, as understood by the early Church, were evidently that they should have been with Him during His ministry, and have seen Him after His resurrection (Acts i. 21, 22: "Of these which companied with us all the time that the Lord Jesus went in and out among us . . . must one be a witness with us of the resurrection"). As a result, however, of exercising its rights in the election of a substitute for Judas Iscariot, in order to maintain the original number, and as a result, further, of admitting into this number an extra apostle in the person of the divinely appointed Paul, the Church evidently considered itself justified in modifying these qualifications, so as to adapt the office to the needs of its developing mission. As a result, others prominent in this work received the name of apostle besides the Twelve and Paul. So James, the Lord's brother, head of the Jerusalem Church, is referred to by Paul as an apostle (Galatians i. 19: "But other of the apostles saw I none, save

James, the Lord's brother." See also I. Corinthians ix. 5, in which passage Paul speaks of his right to lead about a wife "as well as other apostles, and the brethren of the Lord, and Cephas," a statement that would seem to indicate that all the brethren of the Lord were recognized as apostles.) So Barnabas, companion with Paul in his first mission tour, is designated by Luke as an apostle (Acts xiv. 4, 14: "But when the apostles, Barnabas and Paul, heard of it, they rent their garments"). So perhaps Andronicus and Junias, kinsmen and fellow prisoners of Paul's, are mentioned by him as distinguished apostles (Rom. xvi. 7: "Andronicus and Junias . . . who are of note among the apostles"). Possibly, also, Apollos is intended by him to be considered as an apostle together with himself (I. Cor. iv. 6, 9, where Paul speaks of God's setting forth "us the apostles last of all, as men doomed to death"; and the immediate context makes reference, apparently, to Apollos as the one Paul had in mind besides himself). This enlarged application of the term is recognized by patristic writers, such as the author of the *Didache* and of the *Shepherd of Hermas.*

Among the credentials of the apostolic office were apparently the ability to work miracles (e.g. II. Cor. xii. 12: "Truly the signs of an apostle were wrought among you . . . by signs and wonders and mighty works"); also the conversion to God of those to whom they brought the Gospel (e.g. I. Cor. ix. 2: "The seal of mine apostleship are ye in the Lord"). If the office possessed peculiar rights, to these might belong the appointment of the original officers of the local churches (e.g. Acts xiv. 23: "And when they had appointed for them elders in every church . . . "), and possibly, in extreme cases, the regulation of the teaching and morals within the churches' organized limits (e.g. II. Thess. iii. 6: "Now we command you, brethren, in the name of our Lord Jesus Christ, that ye withdraw yourselves from every brother that walketh disorderly, and not after the tradition which they received of us"). The characteristic duty of the office consisted, most likely, in the preaching and missioning of the Gospel (e.g. Acts vi. 2-4: "And the twelve . . . said, It is not fit that we should forsake the word of God and serve tables." I. Cor. i. 17: "Christ sent me not to baptize, but to preach the Gospel"). At the same time, however, as to how far the apostolate was considered by the early Church as an office at all is a question of large debate.

There is no evidence of any division of territory among the Twelve. The nearest approach to this is in the mutual understanding referred to in Gal. ii. 9 ("They gave us the right hand of fellowship, that we should go unto the Gentiles, and they unto the circumcision"), by which Peter was recognized as the leader of the mission to the circumcision, which would naturally mean, in general terms, the Palestinian Jews; and Paul and Barnabas were recognized as the leaders to the uncircumcision, which would as naturally indicate, generally, the Gentiles outside of Palestine; and even this was not strictly carried out, since Paul began his work in most places to which he went by preaching in the synagogue, while the address in I. Pet. would imply that Peter had a considerable parish of Gentile Christians in Asia Minor.

In II. Cor. viii. 23 and Phil. ii. 25, in which passages Paul speaks of the messengers of the churches, the word ἀπόστολος is used in its common classical meaning of delegate, and in Heb. iii. 1, where Christ is referred to as "the Apostle and High-Priest of our confession," the word is applied in the same sense, from the point of view of Christ's divine sending into the world (see John xvii. 18). For details of apostolic life and work, see under individual apostles.

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APOSTLE OF THE ARDENNES, är′dĕn′. An appellation given to St. Hubert, the son of the Duke of Aquitaine, in the reign of Theodoric, King of the Franks. He was converted from a gay life by the vision of a stag bearing a shining cross between its antlers. He was made bishop of Liège in 708, and died 728. A century after his body was transferred to the Benedictine convent of Andoin, in the Ardennes, which thence received the name of St. Hubertus. It was here that he was supposed to have seen the vision.

APOSTLE OF FREE TRADE. A title frequently applied to Richard Cobden (q.v.), author of *The Exponent of the Principles of Free Trade*, for his persistent advocacy of the repeal of the high-tariff policy which England practiced from 1830 to 1846. He gave utterance to the strikingly accurate prophecy that America must at no distant date enter into serious competition with English products; that, in this competition, England would be heavily handicapped by Protection, and that the soundest policy for her lay in the direction of Free Trade. A fluent speaker, he carried these theories into Parliament, and was directly responsible for the repeal of the obnoxious duties on corn.

APOSTLE OF IN′FIDEL′ITY. A term applied to Voltaire on account of his persistent attacks upon the Church, and his unfailing protection of those whom he believed to be persecuted by her. See VOLTAIRE.

APOSTLE OF IRELAND. A title given to Patrick, bishop and saint, who, early in the Fifth Century, felt himself divinely inspired to attempt the conversion of Ireland, which was at that time a heathen country. See PATRICK, SAINT.

APOSTLE OF TEM′PERANCE. Theobald Mathew, so designated through his great labors during the first half of the Nineteenth Century to further the cause of temperance in the United Kingdom, and especially in Ireland, the country of his birth.

APOSTLE OF THE HIGH′LANDERS. A Celtic missionary to the Caledonians, otherwise known as Saint Columba; the founder of the monastery of Iona in or about the year 565.

APOSTLES, ACTS OF THE, APOCRYPHAL. See APOCRYPHA, paragraph New Testament.

APOSTLES, TEACHING OF THE TWELVE. See TEACHING OF THE TWELVE APOSTLES.

APOSTLES' CREED. See CREEDS.

APOSTLESHIP OF PRAYER. See SACRED HEART, LEAGUE OF THE.

APOSTLES' IS'LANDS, or THE TWELVE APOSTLES. A group of islands in Lake Superior, near the western end, belonging to Wisconsin (Map: Wisconsin, C 1). There are in all 27 islands, having an area of 125,000 acres. The largest of the group is Madeline Island, on which are La Pointe, a thriving town, and the La Pointe Indian Reservation. The other important islands of the group are Oak Presque and Outer Islands. These islands were occupied by the French missions as early as 1680.

APOSTLE SPOONS. The name given to spoons, usually in sets of 13, the handles of which are formed by images of the Twelve Apostles and of the Virgin Mary. Up to the Seventeenth Century, such sets were favorite christening gifts.

APOSTLE TO GERMANY. A title given to Saint Boniface, an English missionary (died 755), for his lifelong labors among the Frisian and German tribes.

APOSTLE TO THE ENGLISH. An appellation given to Saint Augustine, who led the body of monks sent to England by Gregory I. to "convert the Angles into angels."

APOSTLE TO THE FRENCH. An appellation of Saint Denis (q.v.), the patron saint of France, who is said to have been beheaded about A.D. 272 at Paris.

APOSTLE TO THE INDIANS, THE. John Eliot, thus styled because of his efforts to convert the Indian tribes of New England in the middle of the Seventeenth Century. See ELIOT, JOHN.

APOSTLE TO THE SCOTS, THE. A term applied to the Scottish reformer and historian, John Knox (q.v.), because of his untiring exertions to spread the Calvinistic doctrines in Scotland at the expense of those of the English and Roman churches.

AP'OSTOL'IC, or **AP'OSTOL'ICAL.** An adjective used in various connections to denote something that is supposed to date from the age of the first apostles of the Christian Church, or to have received their sanction, or to rest upon their authority. As applied to a church, it means that the Twelve Apostles, or at least one of them, taught the truths it stands for. As applied to a doctrine or practice, it means that either it is taught in the New Testament, which, generally speaking, is of exclusively apostolic composition, or that traditionally it has been handed down from apostolic days. The claim to such origin, in particular cases, is much disputed by Protestants among themselves in regard to such points as infant baptism, immersion, and Church government; and by Protestants over against Roman Catholics as to the priority of the Church of Rome and Papal claims generally.

APOSTOLIC BRETH'REN, or APOSTOLICI. The name given in Italy, toward the end of the Thirteenth Century, to one of those sects which, animated by the spirit of an Arnold of Brescia, felt constrained to oppose the worldly tendencies of the Church. Its founder was Gherardo Segarelli, a weaver in Parma. Rejected, from some cause or other, by the Franciscan Order, his long-continued and enthusiastic meditations led him to the profound conviction that it was above all things necessary to return to the simple forms of apostolic life. Accordingly, he went about (1260) in the garb of the apostles, as a preacher of repentance, and by his practical discourses gathered many adherents into a kind of free society, bound by no oaths. At first he managed to avoid any direct collision with the dogmas of the Church; but after twenty years of undisturbed activity and growing influence, Segarelli was arrested by the Bishop of Parma, who, however, soon after released him and kept him in his palace as his fool, and in 1286 banished him from his diocese. Upon the occasion of his release, Pope Honorius IV. renewed a decree of the Council of Lyons (1274) against all religious communities not directly sanctioned by the Papal chair. In 1290, Nicholas IV. setting himself to expose and persecute the Apostolic Brethren, they, on their side, began to denounce the Papacy as the Babylon of the Apocalypse. Many, both men and women, perished at the stake, among them Segarelli (July 18, 1300). But his cause survived him. Dolcino, a more energetic and cultivated man, brought up as a priest, who had previously taken an active part in Tyrol against the alleged corruptions of the Church, now headed the sect in Italy. He taught the duty of a complete renunciation of all worldly ties, of property, and settled abode, etc. Having retreated into Dalmatia, he announced from thence the dawning of the new era, and in 1304 reappeared in Upper Italy, with thousands of adherents, as the enemy of the Papacy—at that time humbled and impoverished by France. In 1305 a crusade was preached against him. He fortified the mountain Zebello, in the diocese of Vercelli, but was, after a gallant defense, compelled by famine to submit. After horrible tortures, which he bore with the utmost fortitude, he was burned at Vercelli, June 1, 1307. In Lombardy and the south of France, brethren lingered till 1368.

APOSTOLIC CON'STITU'TIONS AND CAN'ONS. The Constitutions are a collection of ecclesiastical ordinances, in eight books, erroneously supposed to have been the work of the Apostles, and to have been written down by Saint Clement. In the last chapter of the eighth book the so-called Apostolic Canons, eighty-five in number, are given. It is now recognized that both works are compositions of a later date; but scholars are not yet fully agreed upon the sources and dates for the different parts. The theory most generally held is that the first six books of the Constitutions are based upon the *Didascalia*, a work of the last third of the Third Century; that the seventh book is a reworking of the *Didache*, a Second-Century work; and that the eighth book rests probably upon a collection based upon the Canons of Hippolytus (q.v.). The Canons were probably composed in Syria, and according to Funk, who may be regarded as the best authority, date from the beginning of the Fifth Century. The authority of the constitutions was never accepted in the Western Church, and was rejected by the Eastern at the Council of Constantinople, in 692. The Canons were accepted by the Eastern Church at that council. In the West, the first fifty were translated by Dionysius Exiguus (q.v.), were incorporated in the *Decretum* of Gratian (q.v.), and, although held to be apocryphal, are considered an important source for the rules of the primitive Church. A translation of both may be found in the *Ante-Nicene Fathers*, Volume VII. (Buffalo, 1886), and a bibliography in Volume IX. (Buffalo, 1887). The original text was edited by P. Lagarde (Leipzig, 1862). For the Canons consult especially: Lauchert, *Kanones* (Freiburg and Leipzig, 1896); for the Constitutions, Funk, *Die Apostolischen Konstitutionen* (Rothenburg, 1891).

APOSTOLIC FA'THERS. The name given to the disciples and fellow-laborers of the Apostles, especially to those among them who have left real or so-considered writings behind them. These writings, in Lightfoot's edition, comprise the Epistle of Clement of Rome, and his so-called Second Epistle, which really is not his at all; the seven Epistles of Ignatius of Antioch; the Epistle of Polycarp of Smyrna; the Martyrdom of Polycarp; the Teachings of the Apostles (the Didache); the Epistle of Barnabas; the Shepherd of Hermas; the Epistle of Diognetus; the fragments of Papias; and the Reliques of the Elders, preserved in Irenæus. The writings of the Apostolic Fathers, as to their form and subject, may be looked upon as a continuation of the apostolic epistles, though far inferior to them. Their main purpose is to exhort to faith and holiness before Christ's coming again. Editions of the Apostolic Fathers were published by J. B. Cotelerius (Paris, 1672); W. Jacobson (Oxford, 1838); C. J. Hefele (Tübingen, 1839); A. R. M. Dressel (Leipzig, 1857); Gebhardt, Zahn, and Harnack (Leipzig, 1876-78; text edition, 1877; third edition, 1900); J. B. Lightfoot (texts and English translation, London, 1891; second edition, 1893). There is a separate English translation in *Ante-Nicene Library* (Edinburgh), Volume I., 1867; *Christian Literature* editions (New York) VII. and IX. See the separate articles on the Apostolic Fathers mentioned above.

AP'OSTOL'ICI, or **AP'OTAC'TICI** (i.e., renunciants). A sect of heretics in Phrygia, Cilicia, and Pamphylia, in the Third and Fourth centuries, who renounced all their possessions, forbade marriage as unchaste, and adopted an ascetic mode of life.

APOSTOLIC MAJ'ESTY. A title held by the kings of Hungary, conferred in 1000 by Pope Sylvester II. along with the regal crown upon Saint Stephen, ruler of Hungary, who had not only greatly encouraged the progress of Christianity in Hungary, but actually preached himself. In 1758 the title was renewed by Pope Clement XIII., in favor of Maria Theresa, as Queen of Hungary, and it continues to be used by the Emperor of Austria as King of Hungary.

APOSTOLIC MENNONITE CHURCH. See Mennonites.

APOSTOLIC PAR'TY. The name given in Spain early in the Nineteenth Century to a faction of fanatical Catholics, who demanded the restoration of the Inquisition and the reëstablishment of the unlimited power of the King. They formed themselves (soon after the revolution of 1820) into an Apostolic Party, whose leaders were fugitive priests, and whose troops were smugglers and robbers. They were popularly supposed to be ruled by a committee known as the Apostolic Junta. After taking an active part in all the subsequent agitations, they finally merged (1830) in the Carlist Party.

APOSTOLIC SUCCES'SION. The system according to which a person is consecrated to episcopal authority and office by those who have themselves received it from others, tracing their authority back by successive ascent to the Apostles; the law by which the Church, as an organic body, is made self-perpetuating. Outside of scriptural authority for the doctrine, the Epistles of Ignatius (q.v.) and the earliest canon of post-apostolic times (which orders that the consecrators shall be three, the purpose being that the consecration shall be open and well-known), are appealed to as proofs of the continuity of its maintenance. It is strictly insisted upon by the Roman Catholic, the Eastern, and (in modern theory, though with some very doubtful points in the Sixteenth Century) by the Anglican churches, none of which recognizes as legitimate ministers those who have not received ordination from a bishop in this succession; and a few minor bodies, like the Vaudois and the Moravians, assert that they can trace some kind of succession in a direct line to the apostles. See Bishop; Roman Catholic Church. Consult Haddan, *Apostolic Succession in the Church of England* (London, 1869).

APOS'TROPHE. See Chloroplast.

APOTH'ECARY. See Chemists and Druggists.

APOTHEGM, ăp'ō-thĕm (Gk. ἀπόφθεγμα, *apophthegma*, an utterance). A term used to designate any truth or maxim sententiously expressed. The oracles of the heathen gods often took this form, as also the proverbs, memorable sayings, etc., of the sages of antiquity. In modern times, Lord Bacon has made a charming collection of apothegms.

AP'OTHE'OSIS (Gk. ἀποθέωσις, deification, from ἀπό, *apo*, away + θεός, *theos*, god, deity). The raising of a mortal to the rank of a god. From the polytheistic point of view, there is nothing monstrous in this idea; on the contrary, it is quite natural, and a necessary part of the system. Among pagans generally, and especially among the Romans, every departed spirit became a deity (see Lares); "and as it was common for children to worship (privately) the *manes* of their fathers, so was it natural for divine honors to be paid publicly to a deceased emperor, who was regarded as the parent of his country." At the *Consecratio*, as it was called, of a Roman emperor, the body was burned on a funeral pile, and as the fire ascended, an eagle was let loose to mount into the sky, carrying, as was believed, the soul of the Emperor from earth to heaven. Many coins of deified Roman emperors are found with the word *consecratio* surrounding an altar, with fire on it.

APOX'YOM'ENOS (Gk. ἀποξυόμενος, scraping one's self, from ἀπό, *apo*, away + ξύειν, *xyein*, to scrape). A well-preserved marble copy in the Vatican of a statue by Lysippus, representing an athlete scraping himself with the strigil. It was found in Trastavere, at Rome, in 1849. The original was in bronze, and stood in front of the baths of Agrippa.

AP'PALACH'IAN MOUN'TAIN CLUB. A society of persons interested in the mountains of New England and adjacent regions. It was organized in 1876, incorporated in 1878, and authorized by legislative act of 1894 to hold mountain and forest lands and historic sites. The club aims to preserve the beauty of mountain forests and resorts, to render them attractive to visitors and excursionists, to publish accurate maps thereof, and to collect scientific data concerning the mountains. *Appalachia*, the club journal, has (1906) reached 42 numbers, constituting 10 complete volumes. An annual *Register* has been published since 1879. Several books relating to mountaineering, etc., have been published under the auspices of the society. The club library consists of over 2500 volumes, 1000 pamphlets, 2000 maps or sets of maps, and several notable collections of photographs of mountain views. The club, which in 1906 had 1550 members, holds monthly meetings in Boston from October to June.

APPALACHIANS. The general name for the extensive mountain system in the eastern United States. It extends in a northeast-southwest direction from northern Alabama and Georgia, to the vicinity of Albany, N. Y. Some writers include the Adirondack Mountains, but these constitute an independent though comparatively small system, geologically distinct from the Appalachians. The Taconic, Green, and White mountains are often, and with more reason, considered a part of the general system, as also are the ranges stretching from northern Maine to the Gaspé Peninsula, and reappearing in Newfoundland. At its southern end the system curves slightly to the westward, and beyond the Mississippi Valley is resumed as the Ouachita uplift of southern Arkansas and Indian Territory.

GENERAL CHARACTER. The region proper may be described as a long, narrow plateau, from 70 to 200 miles in width, with an altitude of 1500 to 3000 feet. It is bordered on the east by the well-defined Blue Ridge, and on the west by the Alleghany Mountains, which two ridges lie approximately parallel, and 75 to 100 miles apart, throughout their lengths. Between these outer ranges lie a great number of smaller disconnected mountain ridges, chiefly parallel to the main axis of the system in the central and northern part, but much broken in the southern and southeastern Appalachians. These mountain ridges maintain a remarkably uniform altitude, gradually increasing from both directions toward the central mass in western North Carolina. Lying between the comparatively narrow and regular wall of the Blue Ridge and Alleghanian ranges, west of it, is the great Appalachian Valley, which is a characteristic feature of the topography, for it extends the entire length of the mountain system. Here and there it is broken by minor ridges into two or three parallel valleys, but the general nature of a trough between mountain ranges is maintained throughout. In New York it is known as the Wallkill Valley; in Pennsylvania, the Lebanon, Lancaster, and Cumberland valleys; in Virginia it is the historic Shenandoah Valley, or "Great Valley of Virginia"; and still farther south it is the Tennessee Valley, extending into Alabama and Georgia.

DIVISIONS. The Appalachian region has not a uniform conformation throughout its extent, but is divided into two sections, the Northern and the Southern Appalachians, with the line of separation in western Virginia. This division is not merely of an arbitrary nature, but is founded on well-marked differences in the structural and physiographic features of the two regions. In the northern division the Blue Ridge range has gentle slopes, rising usually to rounded crests, which show a gently undulating sky line, with here and there a peak rising a little higher than the usual level. (See BLUE RIDGE.) To the west of this ridge is a more or less elevated northerly extension of the great Appalachian Valley, which in general presents a succession of depressions and heights, the former worn by streams to a depth, in some cases, of 200 feet, while the latter rise to a height of usually less than 1000 feet above the depressions. The Alleghany Mountains rise west of the valley in bolder sculpturing than that of the Blue Ridge, the side toward the great interior valley, the "Alleghany front," being steep and rugged; but on the side of the Mississippi Valley the slope is gradual, descending westward in lessening ridges from the plateau which marks the summit region; this configuration is due to the fact that the stratified rocks (see below) incline westward, exhibiting their upturned edges in precipices toward the east. Beginning with the Catskills, the line is broken by the broad valley of the Delaware, but reappears in several prominent ranges in Pennsylvania. The westernmost, or 'front' range, is confusingly called First, or Blue Mountain, with Peter's, or Second Mountain, behind it, east of the Susquehanna. East of the Susquehanna, the Tuscarora, Blacklog, Jack's, Standing Stone, and Tussey's are well-defined ranges westward, filling the whole region with crowded heights to the long range distinctively termed Alleghany, which stretches from the border of New York down into West Virginia. In the Virginias both the Blue Ridge and the western ranges become loftier and better defined. The front range is here called the Great North Mountain, and west of it lie successively the Shenandoah and several broken ranges, rising to the continuation of the Alleghanies proper. These draw together at the southwest extremity of Virginia, where a new uplift, the Cumberland Mountains (q.v.), rises west of them, and terminates in the Clinch Mountains. The valley of the Tennessee makes a break, south of which the range reappears in the prolongations of the Cumberland Mountains in northern Alabama. In New Jersey the 'Highlands' of the Blue Ridge rise to heights of 1000 to 1500 feet; in Pennsylvania to 2000 feet; in Virginia from 2000 to 4000 feet (Hawk's Bill, 4066 feet), and with a breadth of 16 miles. In North Carolina, near the Virginia line, the Blue Ridge forks, the Unaka Mountains, of somewhat greater altitude, but of lesser continuity, branching off toward the southwest, while the Blue Ridge proper takes a more southerly course. The Alleghanies, which really begin with the Catskills, in New York State (highest 4200 feet), have in the northern part a general elevation of about 2000 feet, which increases to 4400 feet in Virginia and Kentucky, and still farther south decreases from 200 to 2500 feet. The absence of any isolated peaks is highly characteristic of the whole Alleghanian region; the mountains everywhere present the appearance of long, evenly topped ridges, and the name applies to the whole ridge.

The prominence of the Blue Ridge is the characteristic feature of the southern division of the Appalachians. This rises suddenly from the Piedmont tableland, east and south of it, to heights far greater than the Alleghanies attain. Beginning prominently in South Mountain, in southern Pennsylvania, it stretches southwestward in greater and greater heights, through Virginia and western North Carolina, where it divides, the northern branch continuing westward to Georgia as the Unaka, or Great Smoky Mountains. These form a broad mass of mountains on the border between North Carolina and Tennessee, containing peaks exceeding those of the White Mountains of New Hampshire, and consequently the highest east of the Rocky Mountains. The culminating group, reaching in Mount Mitchell 6710 feet, is known as the Black Mountains (q.v.), and contains many peaks above 6000 feet in height. The Unaka Mountains are characterized by the great sharp-ridged spurs which leave the main chain and preserve its height for a distance of several miles; between these spurs are deep valleys only wide enough at the bottom for the creek-beds which are invariably found there. The altitudes of the extended valleys in this great highland region are from 2000 to 3000 feet. To the west of the steep-sided Unaka ridge lies a valley, about 50 or 60 miles wide, in Tennessee, which contains the Tennessee River and its tributaries, the Clinch, Holston, and French Broad.

GEOLOGY. The Appalachian Mountains are folded mountains; that is, they have been formed by plications or folds of the rock layers that make up the crust of the earth in this region, and the particular type of plication is so well developed in this region that it has received the name of the "Appalachian type" of folding. The Blue Ridge, along the eastern side, consists of layers of crystalline rocks, the oldest known in the Appalachians, that have suffered so great an amount of metamorphism as to render the determination of their exact age a matter of considerable difficulty. They are grouped under the term "fundamental complex," and it is certain that they are in large part pre-Cambrian; and some are even Archæan on the eastern edge of the Blue Ridge. On the western edge isolated masses of Cambrian rocks are found. All these rocks of the Blue Ridge have been much folded and compressed, so that the layers now stand almost on end and are even overturned. Great faults and overthrusts are common, and add to the difficulty of unraveling the structure of the district. In the Appalachian Valley the geological structure is also quite complex, though the strata are not so intensely metamorphosed. The rocks are limestones, shales, and sandstones, and they lie in closed folds that become more open toward the western side of the valley. These folds are peculiar in that their eastward slopes are always steeper than the westward. When the folds are overturned the inversion is toward the east; and overthrusts are also toward the east, and often of considerable extent. This valley is largely the result of the erosion of a great limestone formation, of Cambro-Silurian age, that extends its entire length. The Alleghany Mountains consist of rocks of Paleozoic age, Cambrian to Carboniferous, inclusive, that have been elevated into folded ridges and then eroded to their present topography. The softer beds have been worn into valleys, and the harder beds, having resisted erosion, have been left to form the ridges and benches. In this limestone also have been eroded the wonderful series of caves of the Shenandoah Valley and elsewhere, of which that at Luray, Va., is a striking example (see CAVES). Anticlinal and synclinal folds alternate in diminishing intensity toward the west, where they disappear in the nearly horizontal beds of the Cumberland Plateau, which is made up of carboniferous rocks.

DRAINAGE DEVELOPMENT. The region now occupied by the Appalachian Mountains has been the scene of many physiographical changes too complex to explain here. At a comparatively recent time, however, the whole of the Appalachian system consisted of a great rounded plateau with an elevation of perhaps 4000 feet, the surface of which is called by geologists the Kittatinny Plain. Above this plain arose to a moderate height the now high mountains of western North Carolina. Along a central zone the land increased in altitude to a region in Virginia which thus became the watershed. The rain now did its work, and the great rivers—the New, the Roanoke, James, Potomac, and Susquehanna—cut out their paths through the then nearly level region, and a well-developed system of highlands and drainage was established. However, the subsequent elevation of land in this region by amounts ranging from 200 feet in the north to 1700 feet in Virginia, once more disturbed the adjustment of the water systems, and gave a new impetus to the work of the flowing waters.

While the Appalachian Mountains form the watershed between the Atlantic Slope and the Mississippi Valley, yet throughout there is no definite watershed line on one side of which the rivers flow to the west, and on the other toward the east. In the northern part the streams chiefly break through the mountains from the western side to the east. In the middle part, some escape toward the east and some toward the west; while at the south the eastern mountain range of the Blue Ridge forms the watershed. The water-courses appear to be independent of the direction of the mountain ranges, and instead of pursuing what appear to be the natural directions along the present great valleys, they flow across the ridges through deep gaps in them. This peculiar circumstance is due to the fact that these gaps were cut by the streams before the intervening ridges were upheaved.

The chief streams draining the eastern slope of the Appalachian into the Atlantic are the Hudson and its branches on the west, the Delaware, Schuylkill, Susquehanna, Potomac, and the James, which cut their way eastward through the mountain ranges; and the Rappahannock, Dan, Yadkin (Pedee), Catawba, Broad, Saluda (branches of the Santee), and the Savannah, which rise from the eastern slope of the Blue Ridge, whose western slopes drain into the Susquehanna, Shenandoah (Potomac), James or Tennessee. On the south are the Chattahoochee (head stream of the Apalachicola) and the Coosa (head stream of the Alabama), flowing into the Gulf of Mexico. The streams draining the Appalachian region on the west are tributary to the Ohio River. They are they Hiwassee, the Little Tennessee, and the French Broad, which flow from the Blue Ridge through a network of high mountains, and break through the great Unaka range to the Tennessee; the Holston and Clinch rivers, also tributaries of the Tennessee; the Cumberland, the New (head of the Kanawha), the Little Kanawha, Allegheny, and

Monongahela. The last two join to form the Ohio.

Climate. The climate of the Appalachian Mountains must be characterized as temperate, as they extend from a region in which the average annual temperature is 46° F. southward to a region of 61° F. The region, therefore, partakes of the general climatic conditions of its latitude, modified by its altitude. As the prevailing winds come from the southwest, they do not bring much moisture, and the rainfall and snowfall are not excessive, though greater upon the heights of the central ranges than in the lower areas outside. The rainfall for the year averages about 40 inches throughout most of the Appalachian region, but in the southern section increases to 60 or 70 inches. Droughts frequently occur at the north, but seldom at the south. On the whole, the summer climate of the Appalachian region is delightful, and its charms are becoming more and more appreciated by summer visitors. This attractiveness is increased by the abundance of vegetation, the beautiful scenery, in which grandeur may often be found, and particularly by the presence in many parts of the mountains of springs of saline, chalybeate, and other mineral-bearing waters, both hot and cold. These medicinal waters, together with the purity and energizing character of the air, has long given the mountains, especially in North Carolina and Virginia, a high repute as a health resort.

Vegetation and Fauna. The Appalachian region is covered with a dense forest growth where it has not been removed by man, forest trees covering the mountain slopes practically to their summits, except where the barren rocks furnish no soil. The chief trees in the north are the sugar maple, white birch, beech, ash, pine, and hemlock; in the south, oaks of various kinds, chestnut, hickory, poplar, tulip, ash, beech, maple, linden, red birch, cherry, with a sprinkling of a dozen other varieties. Especially at the south extensive thickets of laurel and rhododendron border the water-courses. Ferns, wild flowers, wild grasses, and the wild pea vine furnish an abundant herbage. In the northern section most of the valuable timber has been removed and vast areas desolated to secure tree bark for tanning purposes. At the South, however, the forests retain much of their primeval character and magnificence, some of the trees being of gigantic size. Of the larger mammalia bears, deer, wildcats, are still common, but by no means plentiful. Wolves and panthers have practically disappeared. Small game birds and, at the South, wild turkeys are plentiful. Unfortunately, rattlesnakes and copperheads are to be found all over the mountains, yet rarely in dangerous numbers. The woods and streams abound, beyond almost any other part of the Temperate Zone, in fresh-water mollusks.

Mineral Resources. Economic products of considerable importance are found in the Appalachian region. Coal (q.v.) is far the most important; the entire anthracite field and part of the bituminous field of Pennsylvania and other States lie in the Alleghany Mountains and the Cumberland plateau or its northern extension. The petroleum and oil fields of New York, western Pennsylvania, and southward, barely touch the edge of the Appalachian region. Of the metals, iron occurs as hematite, limonite, and magnetite at many localities; zinc is found in association with magnetite at the well-known localities of Franklin Furnace and Ogdensburg, N. J., and as blende, calamine, etc., associated with lead, at the Bertha Mines in Wythe County, Va. Lead has been found in small amounts at many points, but does not occur in sufficient quantity to constitute an independent industry. Copper is found native in the crystalline rocks of Virginia, and as chalcopyrite often in large masses, as at Ducktown, eastern Tennessee. Gold and silver occur in small amounts chiefly in Georgia and North Carolina; nickel and cobalt are also found sparingly. Bauxite, one of the ores of aluminum, has assumed great importance in Alabama, and manganese has been mined in large quantities in Tennessee and Virginia. Natural cement, of such high grade as to make it a rival of Portland cement, is found at many outcrops of the Upper Silurian formations in New York, New Jersey, Pennsylvania, and Maryland, and lime is burned throughout the region. Building stone of good quality is abundant, and slate of excellent grade is quarried in New Jersey and Pennsylvania. Asbestos, mica, garnet, and emery are mined in Virginia, the Carolinas, and Georgia, and gems of many kinds are found in the Blue Ridge.

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See Mountain; Anticline; Physiography; Geology; United States.

AP'PARA'TUS (Lat., from *ad*, to + *parare*, to make ready, prepare). In the sciences, a collection of tools or instruments for experimenting or working. In physiology, a group or collection of organs associated in a single function; as, the heart, veins, and arteries are the circulatory apparatus; the legs are the apparatus of locomotion, etc.

APPARATUS, Psychological. See Psychological Apparatus.

APPAR'ENT (Lat. *ad*, to + *parere*, to come forth, be visible). A term used to express a number of important distinctions, especially in astronomy. The *apparent diameter* of a heavenly body is the angle formed by two lines drawn from its opposite ends to the spectator's eye; this obviously depends upon the distance of the body, as well as upon its real magnitude. A planet seen from the surface of the earth seems nearer the horizon than if seen from the centre of the earth: what is seen from the surface of the earth is the *apparent altitude* of the planet; its real altitude would be seen if an observation could be made from the centre of the earth. The apparent altitude differs from the true on account of parallax and refraction (qq.v.). *Apparent noon* is when the visible sun is on the meridian; true or mean noon is the time when the sun would be on the meridian if his motion in the heavens were uniform and parallel to the equator. (See Equation of Time.) The daily and annual motions of the sun in the heavens are both *apparent motions*, caused by two real motions of the earth. In general, apparent phenomena are the phenomena of the actual visible heavenly bodies, while the corresponding true phenomena are what the former would be if certain disturbing causes were eliminated. See also Appearance.

AP'PARI'TION (Lat. *apparitio*, an appearance, from *ad*, to + *parere*, to come forth, be visible). An illusion or hallucination in which objects, commonly human beings, are seen with such vividness as to be regarded as real. The hallucinations of delirium or insanity are not included under this term. Before the diffusion of modern science, there existed a well-nigh universal belief in the reality of apparitions. Greek and Roman poetry abounds with instances; folklore owes much of its attractiveness to its wealth of spectres and phantoms, fairies and brownies, and its witches and ghost-haunted houses. Dr. Johnson voices the universality of this belief, and, incidentally, gives us a glimpse of a vein of superstition and credulity in his nature when, in his *Rasselas*, he causes Imlac to say: "That the dead are seen no more I will not undertake to maintain against the concurrent testimony of all ages and all nations. There is no people, rude and unlearned, among whom apparitions of the dead are not related and believed." It is not difficult to understand how the untutored savage, encouraged by the events of his dream consciousness which led him to believe in a spirit-self existing apart from its body-self, should come to have an equally strong belief in the externality of the apparitions which he saw in his waking consciousness. Indeed, authorities are not wanting who see in the attitude of early man to apparitions the most important, if not the unique, origin of religion. Whether this be true or not, we know that many social phenomena which present religious phases (e.g., witchcraft), have owed the possibility of their existence largely to a widespread belief in apparitions.

The reign of universal superstition has, it is true, given way before the onward progress of the scientific spirit; but the more subtle variations of the belief in apparitions have not as yet entirely disappeared. There still prevails a belief in the supernormal nature of apparitions as manifested in clairvoyance (q.v.), telepathy (q.v.), and spiritualism. We need refer, for example, only to the birth in 1847 of modern spiritualism, as a direct descendant of the belief in "haunted houses." In 1882 the Society for Psychical Research was instituted in England. One of its express purposes was to collect data upon the subject of apparitions. Much material has been published in the "Proceedings" of the Society, and in book form by Gurney, Myers, and Podmore. These authors express the relation of apparitions to telepathy in the following passage: "This book, then, claims to show (1) that experimental telepathy exists, and (2) that appartitions at death, etc., are a result of something beyond chance, whence it follows (3) that these experimental and these spontaneous cases of the action of mind on mind are in some way allied." The opposing position is that of Buckley, who asserts that "before endeavoring to explain how phenomena exist, it is necessary to determine precisely what exists; and so long as it is possible to find a rational explanation of what unquestionably is, there is no reason to suspect, and it is superstition to assume, the operation of supernatural causes." If we apply this criterion to the lately collected evidence for apparitions, we must discount for errors of observation, for errors of memory, and for the strong influence of autosuggestion (q.v.). We shall then find that we have left certain unexplained phenomena. Those who do not believe in apparitions account for these as illusions or hallucinations (q.v.).

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APPEAL' (from Lat. *appellare*, to address, appeal to, call, summon). In English legal procedure, a term that has two distinct meanings.

(1) It denotes an accusation by a private person against another for some heinous crime, demanding punishment on acount of the injury to the appellor, rather than for the public offense. This method of prosecution remained in force until abolished by act of Parliament in 1819 (59 Geo. III., c. 46), although it had been used but rarely for a century prior thereto. The last appeal of murder brought in England (which led to the enactment of the statute above referred to) was that of Ashford *vs.* Thornton, instituted in 1818, and reported in 1 Barnwell and Alderson, 405. See Blackstone, *Commentaries*.

(2) The other signification, attached to the term by Blackstone, is that of a complaint to a superior court of an injustice done by an inferior one. The object of such an appeal is to secure the reversal or modification of the decision of the inferior court through the intervention of a superior tribunal. Originally, the word was confined to a proceeding for the review of a decision in an equity, an admiralty, or an ecclesiastical cause. Common-law judgments were reviewed by a writ of error. The chief distinction between a writ of error and an appeal was that the former brought before the higher court only errors of law in the court below, while the latter brought up questions of fact as well as of law. The tendency of modern legislation is toward the abolition of forms of action and the substitution of an appeal for a writ of error. The grounds of appeal, the courts to which an appeal may be taken, and the methods of prosecuting appeals, are regulated in the various jurisdictions by statutes and court rules. These are so diverse that no attempt will be made, here, to state their provisions. See Court; Pleading.

In parliamentary law, appeal denotes the proceeding by which a member tests the correctness of a ruling of the presiding officer by calling for a vote of the meeting thereon. See Parliamentary Law.

APPEAR'ANCE. (For derivation, see Apparent.) A term used in its most general meaning to signify what is presented in consciousness. It is that of which consciousness is cognizant as an object distinct from itself. For instance, in a perception I may have of a piece of money, its yellowness, its weight, its hardness, are all appearances to me. Now, the fact that appearance is always related to consciousness raises a metaphysical problem; namely, Is there anything more ultimate, more real, than appearance? And, if so, are the yellowness, the weight, the hardness, and other appearances of the coin really a revelation of what the coin is in its deepest nature, or are they merely the form in which that ultimate nature, whatever it may be, is disguised when it comes into my consciousness? Different schools of philosophy have given different answers to these questions, but a careful examination of the answers shows that they are all determined by the view taken of the nature of reality.

(1) Assume that there is a reality different from appearance, that what a thing really is, is what it is in absolute independence of all its relations; assume that "we must everywhere distinguish between the intrinsic being of a thing and its relations," adding that knowledge is always a relation, and it becomes clear that the reality of the thing, its intrinsic being, need not be revealed in the appearance it presents to consciousness. In fact, the question arises whether appearances must not be always deceptive. An affirmative answer to this question is the fundamental tenet of dogmatic skepticism (q.v.) and of critical philosophy (see Kant). A suspense of judgment on the problem is the attitude of the ancient Skeptics. A negative answer given without giving a reason for it, is the attitude of dogmatism. A negative answer can be justified only by showing how consciousness can be in a cognitive relation with reality without truly transforming reality from what it is in its ultimate character. This is what some conceive to be the problem set by the science of epistemology, or theory of knowledge. See Knowledge, Theory of.

(2) Assume we do not and cannot know whether there is a reality distinct from appearance, but that at least we have the conception of its possibility; and the result of this confession is a critical skepticism.

(3) Assume that there is no reality *apart* from appearance, and we have on the one hand Positivism (q.v.), and on the other the idealistic systems of philosophy.

Thus the attitude taken toward appearance may form the basis for one of the most convenient classifications of the different systems of philosophy.

Consult: Bradley, *Appearance and Reality* (London, 1897); Royce, *Conception of God* (New York, 1898), and *The World and the Individual* (New York, 1900); Lotz, *System der Philosophie* (Leipzig, 1884); translated by Bosanquet, 2 vols. (Oxford, 1888); Hegel, *Encyclopädie der philosophischen Wissenschaften im Grundrisse* (Heidelberg, 1830), in part translated into English by Wallace, under the titles, *Hegel's Logic* (Oxford, 1892-94) and *Hegel's Philosophy of Mind* (Oxford, 1894).

APPEARANCE. The legal proceeding by which a defendant brings himself, or is brought, into court, and made subject to its jurisdiction. In modern judicial procedure the actual presence of the defendant is, in civil cases, dispensed with, a written "appearance" being entered in lieu thereof, though in criminal proceedings, especially in cases of felony, actual presence is still generally necessary in order to give the proceedings regularity. In neither case, however, is appearance necessary to give the court jurisdiction of the person of the defendant, that being effected by the service of the process whereby the action is instituted. The usual method of making appearance is for the party to plead, i.e., put in his answer or defense, though it may be done formally, by serving upon the opposing party a regular notice of appearance, or, informally, by any act whereby the jurisdiction of the court is recognized, as by demanding or submitting to a preliminary examination. In civil cases, appearance is usually by attorney. See Action; Answer; Pleading; Procedure.

APPEND'ANT RIGHTS (Lat. *ad*, to + *pendere*, to hang). In English law, certain common rights in the land of another (such as common of pasture) which have existed from time immemorial, and which are historically appurtenant to the land of the person claiming the right. They differ from *appurtenant rights* in that the latter, though also connected with the land of the claimant, may be of modern origin and may be acquired by ordinary prescription (q.v.) or by grant; whereas appendant rights are invariably ancient and cannot be created at the pleasure of the parties. For this reason, the number of such rights is limited and cannot be enlarged. They are probably survivals of community rights in common lands, which have persisted notwithstanding the inclosure of such lands and their appropriation by private owners. See Appurtenance; Easement; Profit à Prendre; and Real Property.

APPEN'DICI'TIS. See Vermiform Appendix.

APPEN'DIX VER'MIFOR'MIS. See Vermiform Appendix.

APPENZELL, ä'pĕn-tsĕl (anciently, Lat. *Abbatis Cella*, abbot's cell). A northeastern canton of Switzerland (Map: Switzerland, D 1), encircled by the Canton of Saint Gall, and divided into the demi-cantons of Ausserrhoden and Innerrhoden. Situated among the Alps, the region is noted for its scenic beauty; in altitude it ranges from 1300 feet, its lowest elevation, to 8215 feet in Sentis. Other prominent points are Heiden, Wildkirchili, Saint Anthony's Chapel, Ebenalp, and the Hone Kasten. The Sitter, a tributary of the Thur, is the chief river. The mountainous character of the surface precludes agriculture on a large scale; but it has rich pastures, and cattle-breeding and dairy-farming are important pursuits, especially in Innerrhoden, which has an area of 69 square miles (population, in 1900, 13,499). Ausserrhoden, with an area of 93 square miles (population, in 1900, 55,281), is noted for its cotton and silk manufactures. Each division has an independent local government, with representation in the Federal Parliament. The local division took place after the religious wars of 1597—

Innerrhoden being almost entirely Roman Catholic, and Ausserrhoden Protestant. Religious intolerance is still strongly marked in the district. Trogen, a village of 2578 inhabitants, noted as a summer resort, is the capital of Ausserrhoden. Appenzell (population, 4369), a former country-seat of the abbots of Saint Gall (whence its name), containing two monasteries, is the capital of Innerrhoden. Consult Richman, *Appenzell, Pure Democracy and Pastoral Life in Innerrhoden* (London, 1895).

AP'PERCEP'TION (Lat. *ad*, in addition to + *percipere*, to seize entirely, observe, perceive). A term first employed by Leibnitz (1646-1716), for whom it signified a spontaneous activity of the ego which exercised such a modifying influence upon the crude "perceptions" of sense that they became transformed into clear and ordered elements of knowledge. This metaphysical concept was used by Kant (1724-1804) in his epistemology, with sharp emphasis upon the spontaneity of the activity. On the other hand, the term was taken over into psychology by Herbart (1776-1841) and his followers, has been reformed and exhaustively treated by Wundt, and more recently has received extended discussion at the hands of the English psychologist Stout.

Herbart and his school, especially Lazarus (1824-1903) and Steinthal (1823-99), lay stress upon the practical significance of apperception. This principle forms, indeed, the corner-stone both of their psychology and of all modern theories of education based upon it. Apperception is "that psychical activity by which individual perceptions, ideas, or ideational complexes are brought into relation to our previous intellectual and emotional life, associated with it, and thus raised to greater clearness, activity, and significance." The mental resultant of previous experience wherewith we meet and receive a new experience is termed an "apperception mass." There will, of course, be individual variations in the nature of this mass; different minds are unequally prepared for a particular experience. One child will call butterflies "flying pansies"; another knows them to be insects. Thus, from the Herbartian standpoint, it is of extreme importance for the teacher to acquaint himself with the existing store of ideas in the minds of the children under his charge, in order that the new matter which he presents may be received by appropriate thought-attitudes.

Wundt's treatment combines the psychological acumen of Herbart with the Kantian emphasis upon spontaneity as the characteristic feature of apperception. It includes a careful analysis of the experience of spontaneity into its ultimate psychical and physiological conditions. The salient points of Wundt's doctrine are as follows: Apperception designates (1) either certain phenomena actually given in consciousness, or (2) a certain activity which we infer from these conscious data—i.e., a concept or category under which the phenomena are grouped. As regards the phenomena themselves, we have to note first that the different components of a given consciousness vary in prominence. Some ideas are clear, standing in the focus of attention (q.v.); others are obscure. Ideas may, then, be in consciousness and yet not be "apperceived." Furthermore, the relation is not fixed. An idea may disappear from the focus of attention and another, previously obscure, take its place. Clearness is not, like quality or extent of sensation, dependent merely upon the character of the stimulus. It is not, like intensity, which it most resembles, a function of a single idea, but attaches to a number of ideas. Now the entrance of an idea into the focus of attention is by no means a simple matter. Analysis discloses, besides the increase of the given idea in clearness, (1) a feeling of activity, (2) inhibition of other ideas, (3) strain sensations and concomitant feelings which intensify the feeling of activity, and (4) the reflex effect of (3), which intensifies the given idea. A careful examination of Wundt's writings shows that the "feeling of activity" is not ultimate and unanalyzable, distinct from either sensation or affection (q.v.), but rather a conventional term representing a complex of sensation and affection from the presence of which in consciousness we infer an activity or spontaneity. Wundt distinguishes between "active" apperception, marked by the feeling of activity, and "passive" apperception, marked by a feeling of passivity, a lessening of the intensity of the concomitant phenomena, and less clearness of the focal idea. In typical passive apperception the clarifying of the idea is determined unequivocally and immediately. In active apperception there are several rival ideas; the result is equivocal and frequently delayed. The conditions of apperception are either (1) objective, viz., (*a*) the intensity, and (*b*) the frequency of the presented occurrence; or (2) subjective, viz., (*a*) the nature of the immediately preceding consciousness, and (*b*) the individual disposition of the mind, as determined by its entire previous history.

Apperception is closely related to association. Association, according to Wundt, furnishes all the possible connections of ideas; apperception decides which of the possibilities shall be realized. Thus the idea *x* may be associatively connected with *a*, *b*, *c*, and *d*, but apperception may bring it about that, in a given case of the arousal of *x*, only *b* appears in attention. This process of choice, of the enhancement of one out of several ideas, together with the feeling of activity, differentiates apperception from association. Apperceptive connections themselves may be either simultaneous or successive. The former are subdivided into (*a*) agglutinations, (*b*) apperceptive fusions, and (*c*) concepts. (See ABSTRACTION.) The judgment is typical of the successive form of apperceptive connections. Stout defines apperception as the "process by which a mental system appropriates a new element, or otherwise receives fresh determination." Great stress is laid upon the "preformed mental system," which is regarded as an organic whole, not (as by Herbart) a mere apperception-mass of presentations. By its reaction upon the further processes of attention, it gives us the clew to the problems of mental growth and mental organization. Stout further introduces the ideas of "negative" and "destructive" apperception. Negative apperception is a form in which the effort to appropriate a new element is unsuccessful; destructive apperception is a form in which "one system by appropriating a new element wrests it from its preformed connection with another system." In each case there results some positive effect; former systems become modified or new systems are developed. The early experimental investigations of apperception deal for the most part with the time-relations of the various factors involved; the later investigations have analyzed the conditions under which apperception occurs. Valuable results have been gained by a study of the apperception of ideas as conveyed by language (q.v.), both spoken and written.

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APPERT, à'pâr', Benjamin Nicolas Marie (1797-c.1847). A French philanthropist and educator, born in Paris. He introduced into several military schools a system of mutual instruction, and in 1820 founded and conducted gratuitously a school for prisoners at Montaigu. He was suspected of having aided the escape of two prisoners and was himself confined in the military prison. Here he made a study of the moral and physical circumstances of the prisoners, and after his liberation he devoted much time to the study of schools, prisons, and hospitals, and published his researches in his *Journal des Prisons* (1825-30). After the Revolution of 1830 he was employed by Louis Philippe to superintend the measures taken for the relief of the indigent classes. He also wrote a work entitled *Dix ans à la cour du roi Louis-Philippe* (1846). In his *Conférences contre le système cellulaire*, he strongly opposed the system of solitary confinement. It is said that he taught at least 100,000 soldiers to read and write. He has been criticised for one-sidedness, but seems to have been a sincere and warm-hearted philanthropist.

APPERT, François (?-1840). A French technologist, the brother of Benjamin Appert. He invented (1804) a method of preserving food, without the use of chemicals. His method is fully described in his work on the *Art of Preserving Animal and Vegetable Substances* (Paris, 1810; English translation, London, 1811). It is the well-known method of placing the article of food to be preserved in a can, after heating it, and then sealing the can hermetically. The publication of his method brought Appert a prize of 12,000 francs from the French Government.

AP'PETITE. See Digestion, Organs and Process of, in Man.

APPIANI, ä'pē-ä'nē, Andrea (1754-1817). An Italian painter, born at Milan. His artistic training consisted in extensive studies of antique sculpture and of the chief masters of the Renaissance, especially of Raphael. He first acquired fame by the frescoes of the palace of Monza and of the cupola of Santa Maria presso San Celso (Milan), and was appointed first painter of the court of Italy by Napoleon. He portrayed the emperor, the viceroy of Italy, and his family, and decorated the royal palace at Milan. After his patron's fall, he was afflicted by poverty and illness, and died of apoplexy.

AP'PIA'NUS (Gk. 'Αππιανός, *Appianos*). A native of Alexandria, who lived during the reigns of Trajan, Hadrian, and Antoninus Pius. He was the author of a Roman history in Greek, entitled 'Ρωμαϊκά, (*Rōmaĭka*), in twenty-four books, of which only eleven are extant. It was not remarkable for anything except the plan on which it was written. Instead of proceeding to exhibit chronologically the growth of the Empire, from its rude beginning on the Palatine Hill to the period when its power held the whole world in awe, which is at once the popular and the philosophical method, he divided his work into ethnographic sections, recording separately the history of each nation up to the time of its conquest by the Romans. First in order were the books devoted to the old Italian tribes, and afterwards followed the history of Sicily, Spain, Hannibal's wars, Libya, Carthage, and Numidia, Macedonia, Greece Proper and its colonies, Syria, Parthia, the Mithridatic wars, the civil wars, and the imperial wars in Illyria and Arabia. As an historian, Appianus is a mere compiler, and not very accurate in his compilation. His geographical knowledge in particular is singularly deficient, considering the age in which he lived. The best edition is that of L. Mendelssohn (Leipzig, 1879-81); translated by H. White (New York, 1899).

AP'PIAN WAY (Lat. *Via Appia*). A Roman road, well named by the poet Statius *regina viarum* (the queen of roads). It was begun by Appius Claudius Cæcus, while censor (B.C. 312). It is the oldest and most celebrated of all the Roman roads. It led from the Porta Capena at Rome in a southerly direction to Capua, passing through Tres Tabernæ, Appii Forum, Terracina, etc. Subsequently, it was carried on to Beneventum, Tarentum, and thence to Brundusium. It was carefully built, though the pavement of large hexagonal blocks, principally lava, on a firm foundation and strengthened by cement, is probably not the original bed. From Rome to Terracina the course is nearly straight, in spite of the steep grades in crossing the Alban Mountains, and the difficulties of the Pontine marshes. Near Rome the road was lined with tombs, of which many remains can still be seen. The most remarkable of these tombs are those of the Scipios, and of Cæcilia Metella. The ancient pavement, in good repair, is still in use in places.

APPIUS, Market of. See Forum Appii.

AP'PIUS AND VIRGIN'IA. A Roman legend of an attempted corruption of maidenly virtue, which has since proved a fertile subject for romancers. The story was originally told by Livy. It is repeated in the *Pecorone di Giovanni Fiorentino*, published in 1378, and again in Painter's *Palace of Pleasure*, in 1566. Modifications of it occur in the *Roman de la Rose* and in Gower's *Confessio Amantis*. "The Doctor" of the *Canterbury Tales* also repeats it in substance. The title has headed no less than three English plays: an early tragical comedy, by an unknown author signing himself R. R., a tragedy by Webster, printed in 1654, and a tragedy by Dennis, in 1709. It is also the subject of a poem, "Virginia," by Macaulay. For other plays on the same subject, see Virginius.

APPIUS CLAU'DIUS CRAS'SUS. A Roman decemvir (B.C 451-449). While the other decemviri were engaged in repelling an incursion made by the Sabines, Appius Claudius and his colleague Oppius remained in Rome, with two legions to maintain their authority. Meanwhile, Appius Claudius had been smitten by the beauty of Virginia, daughter of a respected plebeian named Lucius Virginius, who was abroad with the army. By force and stratagem, representing that she was the born slave of Marcus Claudius, one of his clients, Appius Claudius gained possession of the girl. His design was penetrated by Icilius, who was betrothed to Virginia, and who, aided by Numitorius, her uncle, threatened to raise an insurrection against the decemviri. Virginius, hurriedly recalled from the army by his friends, appeared and claimed his daughter; but, after another mock-trial, she was again adjudged to be the property of Marcus Claudius. To save his daughter from dishonor, the unhappy father seized a knife and slew her. The popular indignation excited by the case was headed by the senators Valerius and Horatius, who hated the decemvirate. The army returned to Rome with Virginius, who had carried the news to them, and the decemviri were deposed. Appius Claudius died in prison by his own hand (as Livy states), or was strangled by order of the tribunes. His colleague, Oppius, committed suicide, and Marcus Claudius was banished.

APPLE. The name applied to a tree belonging to the rose family of plants, as well as to its fruit. The common apple is known botanically as *Pyrus malus;* the Crab Apples belonging to *Pyrus baccata.* All the cultivated apples of the world have come from these two forms. The fruit of the apple is a *pome,* consisting of a thickened fleshy portion, resulting from the development of the calyx, inclosing the horny cells forming the core and covering the true seeds.

The common apple, *Pyrus malus,* has been in cultivation since prehistoric times. Charred remains of the fruit have been found in the mud of the lakes inhabited by the Lake Dwellers, and, according to De Candolle, the tree was probably indigenous to Anatolia, the south of the Caucasus, and northern Russia, and its cultivation began at a very early date. The Siberian Crab, *Pyrus baccata,* is a native of the north, and is of great importance to fruit-growers not only on account of its own hardy and resistant character, but also because it transmits much of its hardiness to its crosses with *Pyrus malus,* thus producing a fruit of good quality that can endure northern climates. Besides these European apples, North America has several wild species which are more or less notable. Among these, the Prairie Apple, *Pyrus Ioensis,* is perhaps the most promising from a horticultural standpoint, because crosses between it and *Pyrus malus* (to which class the so-called *Pyrus soulardii* undoubtedly belongs) are already valuable. The eastern wild apple, *Pyrus coronaria,* is of little value for its fruit, but its bloom is beautiful. China and Japan have native apples which are of little economic importance, but are interesting in that they carry the genus through the north temperate zone around the world.

Crab Apple, or Crab. A term applied indiscriminately to all small fruits of the apple, regardless of species. Sometimes, however, it is confined to a class of small, long-stemmed fruits belonging to *Pyrus baccata.*

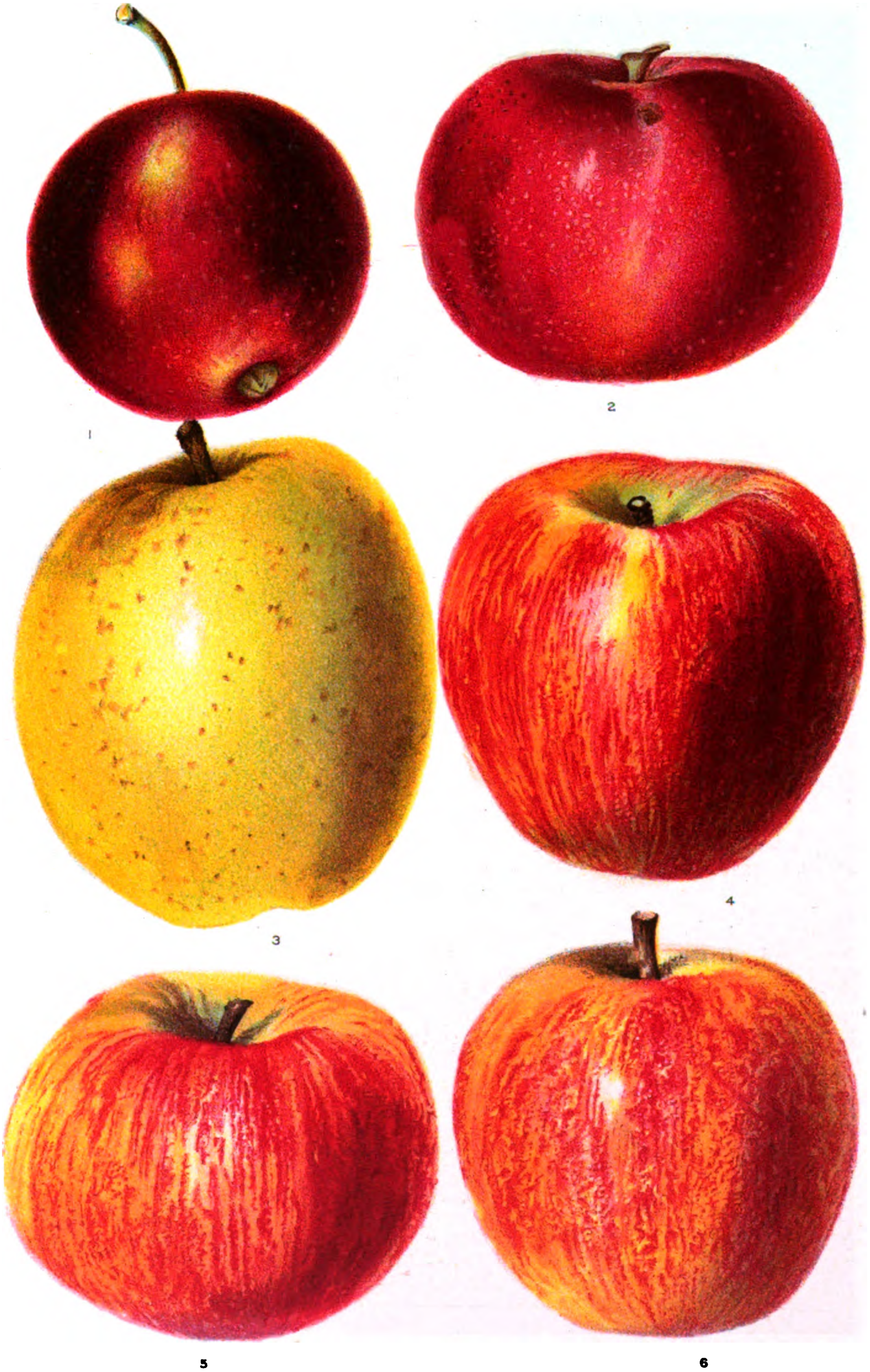
Economically the apple is the most important fruit of temperate regions. It is grown over a wide area, prospering as far north as Scandinavia and as far south as the southern mountain districts of the United States. It has, moreover, been carried into the Southern Hemisphere, and now, with rapid ocean transit, New Zealand and Tasmanian apples are annually offered during April and May in the markets of London and San Francisco.

North America is the leading apple-growing region of the world. Apples are raised on a commercial scale from Nova Scotia south to Virginia and west to Wisconsin, Iowa, Nebraska, Kansas, and Missouri. They are also raised in Oregon and California. These several regions produce an annual aggregate product of one hundred million barrels. The great portion of this yield finds a ready market within the domain of North America; but a small fraction of the crop is annually exported, mainly to Liverpool, London, and Glasgow. The export trade is gradually increasing, and the Mediterranean countries may be counted upon as a future market for American apples.

The apple is propagated both by budding, and by grafting the desired sort on young seedling trees, which are usually grown from seeds obtained from apple pomace at the cider mills. (See Budding; Grafting.) Such seeds give a progeny variable both in hardiness and in habit of growth, and are therefore less desirable for stocks than seedlings grown from seeds of the wild *Pyrus malus* of Europe. Budded trees are preferred by most growers, as well as nurserymen, in the southeastern and eastern parts of the United States. To the nurseryman, the chief advantage of a budded tree comes of its quick growth, which shortens the time during which money invested is non-productive. The root-grafted tree is preferred by planters in the Northwest; such trees form roots from the scion, if a short piece-root is used. This, sooner or later, produces a tree on its own root, which in turn eliminates the uncertainty of the seedling root and, when "iron-clad" scions are used, gives a perfectly hardy tree. Grafting is again important for the purpose of converting bearing trees, of several years standing, from one variety to another.

Dwarf apples are grown as espaliers in parts of England. The dwarf trees are obtained by grafting the desired variety on Paradise or Doucin stocks. These are dwarf forms of *Pyrus malus.* New varieties of apples are obtained by sowing the seeds of cultivated sorts. Seeds from such fruits are more variable than those from wild trees, and consequently more likely to give desirable offspring. This operation is one of chance; frequently thousands of seedlings are grown without producing one valuable tree. Apple trees grow large and endure many years. In planting an orchard, therefore, the trees should be given ample room; 40 feet each way is close enough in New York and the New England States, where the trees grow largest. Farther south, where the trees do not attain great size, and are shorter-lived, 33 to 35 feet apart each way is not too close. In the Northwest, trees should be planted even closer than this, for there they are liable to injury from sunscald and wind. Closely planted and low-headed trees serve as a mutual protection. Soils for the apple which have given the best crops and have produced longest lived trees, are chiefly composed of clay or clay-loam impregnated with

APPLES



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1	HYSLOP CRAB	NATURAL SIZE	4	BEN DAVIS	3/4 NATURAL SIZE
2	RED ASTRACHAN	3/4 NATURAL SIZE	5	NORTHERN SPY	2/3 "
3	YELLOW BELLFLOWER	2/3 "	6	HUBBARDSTON	3/4 "

gravel. Such land, situated so as to afford good air as well as land drainage, produces more regular crops of highly colored and highly flavored fruits than lower and heavier lands. Atmospheric drainage is one of the best material safeguards against late spring frosts, and good land drainage assures a congenial soil for the plant.

The greatest demand in the ripening of the fruit and seed is made upon potash and phosphoric acid. These are the two ingredients most frequently needed by the orchard. If nitrogen be lacking, it can be made up by growing a leguminous crop, such as Canada peas, cow-peas, or beans, upon the soil and turning it under.

CULTIVATION. Good cultivation is an important part of orchard management. Two crops can seldom be profitably grown on the same soil at the same time. The orchard should not be used as a pasture lot or as regular farm land. Cultivation should be done early in the season to stimulate early growth, but discontinued by July 15th in the United States in order that growth may be checked and the wood mature properly to insure hardiness during the winter and a crop the following season. Another essential is proper pruning. This must be modified to suit the variety, locality, and purpose for which the tree is grown. In general, a low head, wide-spreading branches evenly disposed about the trunk and at different heights are desirable ends.

HARVESTING AND STORAGE. The recent work of Powell and Fulton has shown that apples should be fully grown and highly colored to give them the best commercial and keeping quality. When harvested in that condition they are less likely to scald in storage, and are worth more money than when picked in a greener condition. Overgrown apples, such as those produced on young trees, are an exception, and require earlier picking. After the fruit is picked the ripening processes continue much more rapidly at the same temperature than when the fruit is left on the tree. Therefore, after picking, the fruit should be taken at once to the storage room. Any bruising or rough handling hastens decay. The fruit keeps best and longest if stored at a temperature of 31° F. Early apples keep best in small packages which cool down rapidly in storage. Winter apples keep satisfactorily in barrels. Wrapping each fruit with unprinted newspaper prolongs the keeping quality and reduces the amount of decay. Wrapping is commercially profitable only with the highest dessert quality of fruit, or for home use.

VARIETIES. Each section of the world possesses a certain number of varieties which are peculiarly suited to its soil and climate. When apple-culture is to be extended to a new region, the problem to be solved is, to ascertain which varieties are best adapted to the conditions prevailing in that region. In the United States, the varieties held in highest favor by the inhabitants of any given locality have usually proved safest to plant for commercial purposes.

USES. The apple is used most extensively for cooking and for eating out of hand. It is also employed for cider making and vinegar making, the finest vinegar being made from apple juice. For these purposes smaller or inferior fruits are usually taken. Brandy and other beverages are made from the juice also. Large quantities of the fruit are now dried in evaporators, the product being quite extensively exported to European countries.

APPLE DISEASES. The apple is subject to a number of well-known fungous diseases, the more important of which are the *rust, scab,* and *bitter* or *ripe rot*. The *rust* is due to the fungus *Rœstelia pirata*. This fungus is peculiar in that it spends part of its life on the apple tree and part on the cedar. It causes yellow spots on the leaves of the apple in May or June, attacking the fruit about the same time and rendering it worthless. Upon the underside of the leaves and on the swollen, diseased parts of the fruit, vast quantities of spores are produced, which find their way to some cedar or juniper tree. Here they cause enlargements on the branches. These swellings, or cedar apples, as they are called, are half an inch or more in diameter, and ripen the next spring, when their horn-shaped, orange-colored masses are easily to be seen. On these are borne spores, minute and easily blown about. Some of these find their way to the apples. The form on the cedar is known as *Gymnosporangium macropus*. Instead of depending upon the cedar for the alternate generation, the mycelium of the fungus may find its way into the buds and young twigs of the apple tree, and from them infest the next crop. Destroying all cedar trees and thoroughly spraying the trees with Bordeaux mixture (see FUNGICIDE) upon the appearance of the leaves will aid in keeping the disease in check. The *apple-scab* is caused by the fungus *Fusicladium dendriticum*. Both leaves and fruit of the apple and pear are subject to this disease. Upon the fruit dark circular spots are formed. The centres of the spots are dark brown or black, with light-colored edges. Often a number of spots run together, when the fruit usually cracks, showing hard, brown tissue within. The diseased area ceases to grow, and one-sided fruit is produced. Upon the leaves the appearance is somewhat similar to that upon the fruit, except that the light border of the spot is lacking. The leaves become crumpled and ragged, and finally fall off. This is undoubtedly the most serious fungous disease to which apples and pears are subject, and no locality seems entirely free from it. Differences have been noticed in the susceptibility to the disease of different varieties. Spitzenberg, Fameuse, Fall Pippin, and Harvest apples are especially subject to scab; while Ben Davis, King Fallawater, and many others are less seriously affected. This disease and the loss caused by it may be prevented by thorough spraying with Bordeaux mixture or similar fungicide, three applications being given the trees at intervals of about ten days, beginning at the swelling time of the buds. In many of the Southern States, as well as in northern localities, the *bitter rot* is the cause of much loss to fruit-growers. This rot, due to the fungus *Glœosporium fructigenum*, attacks the fruit at any stage of growth. The diseased tissue becomes brown and very bitter; hence the name. Spraying as recommended above, is the preventive treatment. A *black rot* caused by *Sphæropsis malorum* is similar to the bitter rot, and yields to the same treatment. A disease, known as the *brown spot* of Baldwins, is common to that and many other varieties. The flesh becomes dry and brown in any part of the fruit. Its origin is obscure, and reliable preventives are unknown. A serious disease of the apple tree in Europe, lately found in the United States also, is that known as *apple-tree canker*, caused by *Nectria ditissima*. The fungus gains entrance through wounds, destroying the bark, and later attacking and destroying the wood. Where the attack is slight, cutting out the diseased areas and coating the cut surface with tar will prove beneficial. Where the tree is seriously affected, it should be cut down and burned, as it cannot be restored to health and is a menace to sound trees. This same fungus attacks a number of other kinds of trees, as oak, alder, dogwood, maple, etc.

Insect Pests. A large number of insects injuriously affect apple trees and fruit, among which certain beetles and moths are preeminent. *Borers.*—Wood-boring beetles are very destructive, especially the round-headed borer (*Saperda candida*) (see Plate of Beetles), and the flat-headed borer (*Chrysobothris femorata*). The former is the worst enemy, after the codling-moth, of apple-culture in the United States; and like the others does its damage as a grub, born from an egg laid in the bark, where it bores into and feeds upon the sap-wood. A special description of these beetles and other apple-eating beetles, with advice as to control of similar pests, is given by F. H. Chittenden in *Entomological Circular No. 32*, second series, and *Bulletin 22*, of the United States Department of Agriculture (Washington, 1898-1900). Various root-borers and fruit-borers are also to be feared here and in foreign lands, especially in Australia, where also a harlequin fruit-bug is dangerous. *Moths.*—Important enemies are to be found among the Lepidoptera, which place eggs within the blossom, whence caterpillars develop within the ripened fruit; or which destroy the leaves. The tent-worms and canker-worms (q.v.) are prominent among these. In Europe the principal damage is done by a small white, black-spotted ermine-moth (*Hypnomeuta padellus*), and in Japan by a moth (*Laverna herellera*), whose larvæ live in the core of the fruit. The worst American insect of this class is the codling-moth, which may be treated by spraying with an insecticide (q.v.). Paris green or London purple is most frequently used for this purpose. A calendar showing the kind and approximate time of spraying to check insect pests and diseases is given below:

SPRAY CALENDAR FOR THE APPLE.

NAME OF TROUBLE.	I TREATMENT.	II TREATMENT.	III TREATMENT.	IV TREATMENT.	V TREATMENT.
Scab	Copper sulphate solution before buds break.	Bordeaux mixture when leaf buds are open but before flower buds expand.	Bordeaux mixture and Paris green as soon as blossoms have fallen.	Bordeaux mixture 10—12 days after (III).	Repeat (III) once or twice at intervals of two weeks.
Rust	" "	" "	" "	" "	" "
Brown Spot	Bordeaux mixture at same time as Treatment II for Apple Scab.	Same as III for Apple Scab.	Same as IV for Apple Scab.		Note—This disease is liable to cause loss of foliage near harvest time. Ammoniacal Copper Carbonate should be used for late treatments.
Bitter Rot	Bordeaux mixture about July 15 as a safeguard.	Bordeaux mixture 10 days later.	Ammoniacal Carbonate of Copper as substitute for Bordeaux as soon as fruits are three-fourths grown.		
Tent Caterpillar	Paris green in II treatment for Scab.				
Canker Worm	Paris green or London purple before blossoms open or as soon as they fall.				Note—To lessen expense, combine insecticides and fungicides—i.e., use Paris green or London purple with Bordeaux mixture whenever the poison is desired.
Codling-moth	Paris green or London purple. See III treatment for scab.	Repeat (I) in 8 to 10 days.	Repeat (I) in two weeks after (II).	Repeat (I) if second brood is troublesome.	
Bud-moth	Paris green as soon as tips of leaves show in bud.	Repeat (I) before blossom buds open.			

Directions for making and applying these sprays may be found in the article Fungicide.

Fossil Forms. The genus *Pyrus* is known in a fossil state from the Cretaceous of North America and the Tertiary of North America and Europe.

Consult: J. A. Warder, *American Pomology, Part I., Apples* (New York, 1867); Bailey, *Field Notes on Apple Culture* (New York, 1886); Report of the Kansas State Horticultural Society, *The Apple* (Topeka, 1898); Reports of United States Department of Agriculture, Division of Pomology (Washington).

APPLE BRAN'DY. Brandy produced by distilling the fermented juice of apples. It was at one time extensively produced in New Jersey, where it was known as "Apple-jack," and on account of its ardent and intoxicating qualities as "Jersey Lightning." The process of manufacture is similar to that employed in distilling the juices of other fruits, which will be found described in the article Distilled Liquors.

APPLE OF DISCORD. A golden fruit bearing the inscription, "For the most beautiful," which was thrown by Eris, or Discord, into the midst of the company at the marriage of Peleus and Thetis. The prize was claimed by Juno, Minerva, and Venus, and was adjudged to Venus by Paris, who was called in to make the award. The decision brought about the Trojan War.

APPLE OF SOD'OM. See Sodom, Apple of.

APPLE SHELL, or APPLE SNAIL. A large, globose, amphibious mollusk of the warmer parts of Africa and America, of the family Ampullariidæ. They inhabit marshes, attaching their large eggs to the leaves of water plants, where they are searched for and devoured by birds. They possess both lungs and gills, and in some regions use both these organs in rapid alternation, as was observed by Semper (*Animal Life*, New York, 1881, p. 191) in the Philippines. "The ampullaria," he remarks, "lying not far from the surface of the water, protrudes above it a breathing siphon, and inhales air through it; then it closes its lungs, reopens the siphon, and admits a stream of water through it into the branchial cavity." The shells are large, thin, brilliantly striped (see colored plate of Snails), and are known in South America as idol-shells. See plate of Abalone, etc.

AP'PLETON. A city and the county seat of Outagamie County, Wis., 120 miles northwest of Milwaukee, on the Chicago and Northwestern, and Chicago, Milwaukee, and St. Paul railroads (Map: Wisconsin, E 4). It is situated on the falls of the Fox River, which by a series of dams is navigable for steamboats and, with a fifty-foot fall, supplies extensive water power for various manufactures, chief of which is paper. The dairying interests also are important. Appleton has a public library and is the seat of Lawrence University, a Methodist Episcopal institution, organized 1847. Appleton was settled in 1848, and incorporated as a village in 1853, as a city in 1857. A mayor, elected biennially, and a bicameral city council, composed of the city officials, and twelve aldermen, are provided by the amended charter of 1886. Population, 1890, 11,869; 1900, 15,085; 1905, 17,000.

APPLETON, Charles Edward (1841-79). An English editor. He was born at Reading, and was educated at Saint John's College, Oxford, and in Germany. He is remembered chiefly as the organizer of the movement for the "endowment of research," and as founder (1869) and editor (1869-79) of the *Academy*, the distinguishing characteristic of which was its signed articles. Consult: John H. Appleton and A. H. Sayre, *Life and Literary Relics* (London, 1881).

APPLETON, Daniel (1785-1849). An American publisher. He was born in Haverhill, Mass.; first engaged in the dry-goods business there and in Boston, and in 1825 removed to New York to follow the same business. He gradually combined the importing of books with the dry-goods trade, and finally devoted himself entirely to the book business, publishing his first book in 1831. The firm which he established, known ever since as D. Appleton & Co., is continued by his descendants.

APPLETON, George Swett (1821-78). An American publisher, the third son of Daniel Appleton. He was born in Andover, Mass., studied at Leipzig, and for a number of years was a publisher and bookseller in Philadelphia. In 1849, with three brothers, John, William, and Sidney, he succeeded to his father's publishing business in New York.

APPLETON, James (1786-1862). An American temperance reformer, born at Ipswich, Mass. He fought as colonel of militia in the War of 1812, and was promoted to be a brigadier-general. Having removed to Maine, he was elected to the Legislature of that State in 1836. In 1837 he presented to the Legislature a report in which were advanced the principles that afterward became the basis of the Maine liquor law.

APPLETON, Jesse (1772-1819). An American educator. He was born at New Ipswich, N. H.; graduated at Dartmouth College in 1792, and was ordained pastor of the Congregational Church, Hampton, N. H., in 1797. From 1807 to 1819 he was president of Bowdoin College. President Franklin Pierce was his son-in-law.

APPLETON, John (1815-64). An American diplomatist. He was born at Beverly, Mass., and graduated at Bowdoin College in 1834. He was *chargé d'affaires* to Bolivia (1848-49), a member of Congress from 1851 to 1853, secretary of legation in London (1855-56), assistant secretary of state (1857), and minister to Russia (1860-61).

APPLETON, John Howard (1844—). An American chemist. He was born at Portland, Maine, and received his education at Brown University, where he became instructor in 1863 and professor of chemistry in 1868. He wrote a series of popular text-books that are well known for their attractive form and clearness of exposition. The series includes: *The Young Chemist* (Philadelphia, 1878); *Qualitative Chemical Analysis* (Philadelphia, 1878); *Quantitative Chemical Analysis* (Boston, 1881); *Chemistry of the Non-Metals* (Providence, 1884); *The Metals of the Chemist* (Providence, 1891); *Chapters on the Carbon Compounds* (Providence, 1892); and *Lessons in Chemical Philosophy* (2d ed. New York, 1890).

APPLETON, Nathan (1779-1861). An American merchant, born at New Ipswich, N. H. He was in partnership with his brother Samuel in Boston. With others, he started the first power-loom for weaving cotton in the United States. He was one of the Merrimac Company whose enterprise founded the city of Lowell (q.v.). He served several terms in the Massachusetts Legislature; in 1830 and in 1842 he was a member of Congress, where he was one of the prominent advocates of a tariff for protection.

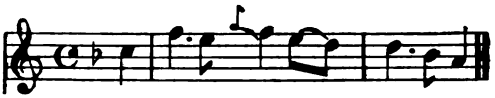
APPLETON, Samuel (1766-1853). An American merchant and philanthropist, brother of Nathan Appleton, born at New Ipswich, N. H. He passed his boyhood on a farm. In 1794 he and his brother Nathan went into the English trade in Boston, and afterwards added cotton manufacturing, in which they made a fortune. He retired from active business in 1823, and devoted his entire income to benevolent and scientific purposes, for which he bequeathed $200,000.

APPLETON, Thomas Gold (1812-84). An American poet, artist, and scholar, patron of art and science, born in Boston. He was a brother-in-law of the poet Longfellow, and was a noted wit and *raconteur*. His verses are collected in *Faded Leaves;* his prose in *A Nile Journal* (1876); *Syrian Sunshine* (1877); *Windfalls*, etc. His *Life and Letters* were edited by Susan Hale (1885). He founded the Boston Literary Club.

APPLETON, William Henry (1814-99). An American publisher. He was born at Haverhill, Mass., and studied in secondary schools. In 1848 he became the senior member of the firm of D. Appleton and Company, and for sixty years was prominent in the book trade. He was active in the struggle for an international copyright. Among the publications brought out by him were *The New American Cyclopædia* (New York, 1858-63) and the *Webster's Spelling-Book* (New York, 1858).

APPLIQUÉ, ȧ'plė'kā' (Fr., p.p. of *appliquer*, to put on). In needlework, a pattern cut out from one foundation and applied to another.

APPOGGIATURA, ȧ-pŏd'jȧ-tōō'rȧ (It., from *appoggiare*, to lean, rest). One of those melodic ornaments which are regarded as accessory notes having no time-value, and which are printed in small characters. There are two distinct varieties of the appoggiatura, the long and the short. The *Long Appoggiatura* was a device of the early classic composers, who disliked to use unprepared suspensions, and invented the idea of covering or disguising them by writing them in small notes, as mere embellishments of the melody. This unhappy inspiration has been a source of needless trouble to the music-student, who is obliged to learn various rules for the proper execution of this device, in which a note is given one value in writing and another in performance. The time of an appoggiatura is taken from that of the following or "principal" note, and the appoggiatura note is marked with its actual value, while the principal note is marked with the value which both together have. The general rule for its execution is that the appoggiatura is played exactly as if it were written as a large note, and the following note is given what remains of its face value, as shown in the following examples:



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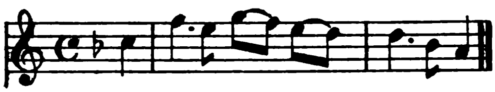


PLAYED THUS.

The *Long Appoggiatura* always occurs *on* the beat, and has, therefore, the accent which the principal note *appears* to have. When written before a chord, the appoggiatura only delays the note to which it belongs.

This device has been entirely discarded by modern composers, and Dr. Hugo Riemann wisely suggests that in new editions of the old works it should be removed, and the notes rewritten in the form in which they are to be played.

The *Short Appoggiatura*, now commonly called a grace-note, also originated in the early classic period. It is written as an eighth note, with a stroke through the stem, ♪ and is played so quickly that it really has no perceptible time-value. Opinions differ as to whether it should be played on the beat or before it, the difference being merely a question of accent. The classic tradition and conservative opinion demand its execution on the beat, but many musicians of the present day consider it more graceful and more truly ornamental if played without accent, before the beat. The final decision must be left to the taste of the performer.

APPOINT'MENT (Fr. *appointement*). In English and American law, the act of vesting an estate in one's self or in another, under a power or authority so to do, conferred by the owner of the land. Such powers are created by deed or will, and must be exercised in the manner prescribed by the instrument conferring the power, but only by an instrument competent to create or transfer an interest in real estate. See Power of Appointment.

Appointment to Office is the formal designation, by one in whom the authority has been lawfully vested, of a person to hold a public office or perform a public duty. The term is not properly applicable to the choice of an officer by public election. Usually a certificate, or commission, signed by the appointing officer, is required by law, and this becomes a public record, and constitutes the appointee's evidence of title to the office, and his justification for exercising its powers, without which such exercise constitutes usurpation. As to the nature of the rights conferred by an appointment, see Office, and articles referred to; also De Facto.

APPOLD, ăp'old, John George (1800-65). An English inventor. His chief inventions were an improvement of the centrifugal pump, a process for dressing furs, and an apparatus for paying out submarine telegraph wire, which was very useful in laying the Atlantic cable.

AP'POMAT'TOX COURT'HOUSE. A village in Appomattox County, Va., about twenty-five miles east of Lynchburg. Here General Lee surrendered the Army of Northern Virginia to General Grant, April 9, 1865, virtually ending the Civil War.

APPONYI, ŏp'pô-nyi, György (George), Count (1808-99). A Hungarian statesman. He was a member of the Presburg Diet of 1843-44, and Hungarian court chancellor in 1847. He was the leader of the Conservative Party, and opposed the revolutionary movement of ,1848-49. He lived in retirement until 1859, when he became a member of the Austrian Reichsrath, where he displayed great ability as a leading advocate of various plans for restoring the Constitution to Hungary. In 1861 he opened the Diet at Budapest as Royal Commissioner and presided over the sittings of the Upper House. He was most influential in bringing about the transformation of Austria-Hungary on the present dual basis. —Apponyi, Albert, Count (1846—). Son of the preceding, a prominent member of the Hungarian Diet. He was originally the leader of the Conservative "National Party," but in 1899 joined the Liberal party and in 1901 was elected president of the Chamber of Deputies. He resigned in 1903, announced his secession from the Liberal party and in 1904 reorganized the National Party. With his followers he joined the Coalition which brought about the fall of the Tisza cabinet in 1905. In April, 1906, he became minister of education in the compromise Wekerle cabinet.

APPORTIONMENT (Lat. *ad*, to + *portio*, part, share, portion). A partition and readjustment of legal rights or obligations to conform to a change in the relations of the parties thereto, and to adjust their respective interests in the subject-matter affected by the change. Apportionment is of frequent occurrence in the law, and may conveniently be considered, first, with reference to the division of claims, or rights, and, second, with reference to the division of obligations, or burdens.

Apportionment of rights occurs where a person having an interest in land or a contract right, entitling him to the use or profits of the land or to payments of money, parts with such right or interest to another, in whole or in part. Thus, if the owner of land which is subject to a lease at a fixed rent, sells a portion thereof, the purchaser is entitled to have the entire rent apportioned so that he shall receive the share due from the parcel of which he has become the owner. So, also, apportionment of rent takes place where an entire tenement or estate is partitioned among tenants in common, or passes by will or otherwise to several persons in parcels. Again, if the owner of land under cultivation, for the benefit of such land and of every part of it, enjoys an easement or profit *à prendre* in the land of another, as to take water for irrigation, or manure or seaweed for fertilizing it, a conveyance of a part of his land carries with it a right to a proportionate enjoyment of such easement or profit. This will, of course, be true only in cases where the right so claimed and enjoyed is apportionable or divisible in its nature. A right of way or a right to pasture one's cattle on a neighbor's land would not ordinarily be apportionable, though it is said that a right to pasture a certain number of cattle may be apportioned. The foregoing are all cases of apportionment "in respect of the estate or interest enjoyed," and present no great difficulty. But where the apportionment claimed is "in respect of time," as where the new right accrues between fixed periods of payment, the law is not so simple or consistent. At common law, rents, annuities, dividends, and similar payments falling due at fixed periods were not deemed apportionable in respect of time. That is to say, if an annual rent or a dividend were due on the first day of January, a conveyance of the land or of the corporate shares on the 31st of December would carry with it the entire rent or dividends. No part of it being due until the whole was payable, it was not considered capable of being apportioned. Interest on money loaned was an exception, as in theory of law interest was earned—i.e., accrued—from day to day *(per diem in diem)*, notwithstanding the fact that by agreement of the parties the payment was postponed to a fixed date. The inequitable operation of this rule regarding fixed payments and the inconveniences resulting from it have brought about a general change in the law, by statute, both in England and in the United States, and it is now provided that all rents, annuities, dividends, and other periodical payments in the nature of income, are to be considered as accruing from day to day, and to be apportionable in respect of time accordingly. At the present time the question of the apportionment of fixed payments presents itself most frequently in connection with the respective claims to income of life tenants and remaindermen, or of the executor of a deceased testator and the person entitled under his will to corporate stocks left by him. The calculation of the respective shares of the parties is sometimes intricate and difficult, depending upon tables of longevity, but the principles governing their interests are as simple as they are just and convenient.

Apportionment of obligations depends on very different principles from those which result in apportionment of rights or claims. Indeed, it may be asserted, as a general proposition, that burdens are not apportionable. A tenant cannot, by alienating a portion of his tenement, relieve himself of any part of his obligation to pay rent; nor can a person, by rendering only a part of the service which he has contracted to perform, entitle himself to compensation for the service rendered. Rights are assignable; obligations are not assignable. No man can at his own will, or by his own act, rid himself of a legal duty by transferring it to another. This is true even of burdens which, in theory of law, rest upon land, as mortgages, servitudes, and other incumbrances. The partition of the land among several owners will not, in general, relieve any portion thereof of the burden which rests upon the whole and upon every part and parcel thereof, although, as between themselves, the several owners may be entitled to an equalization of the obligation which each is equally liable to perform. (See CONTRIBUTION; EXONERATION; SUBROGATION.) The severity of this rule has been relaxed in a few exceptional cases. Thus, it is held that where a person fails to complete a contract for personal services, in consequence of subsequent disability or death, compensation may be recovered for the services actually rendered. (See RESCISSION; CONTRACT.) Again, in cases where a tenant under a rent is evicted from a part of the premises by paramount title—i.e., by some one having a title superior to that of his landlord—the rent is apportioned, the tenant being liable only for the use and occupation of the part actually retained by him. If, however, the eviction be by the landlord himself or by a stranger, or even if it be by the destruction of the premises, in whole or in part, there will be no apportionment of the rent, the tenant in the former case being freed from all his obligations under the lease, and in the second case continuing liable for the whole rent, notwithstanding the eviction. See EVICTION; LANDLORD AND TENANT; RENT; and the authorities noted under the various titles above referred to.

APPORTIONMENT BILLS. In the United States, laws passed by Congress after each decennial census, to define the number of members of the House of Representatives to which the several States are entitled. Every State has at least one member. Eleven apportionment bills have been passed. The first constitution adopted by the original thirteen States fixed the number of members at 65, and the ratio of representation at 30,000. Representative population then meant all free white citizens and three-fifths the number of slaves; two-fifths of the slaves, all aliens, and Indians not taxed, were excluded from any share in choosing members of Congress. The Fifteenth Amendment to the United States Constitution conferred the franchise on the emancipated slaves in the South. The following figures show the variations of apportionment made for each census:

Period.	States.	Members.	Pop. to a member.
1789	13	65	30,000
1790	15	105	33,000
1800	16	141	33,000
1810	17	181	35,000
1820	24	213	40,000
1830	24	240	47,700
1840	26	223	70,680
1850	32	234	93,423
1860	34	243	127,381
1870	37	293	131,425
1880	38	325	151,913
1890	44	356	173,901
1900	45	386	193,175

The House had grown rapidly in number of members until 1830, when it was found that it would soon become unwieldy unless the number of representative population required to a member should be largely increased; so the ratio was increased by one-half (raised from 47,700 to 70,680). Since then the purpose has been to keep the House below 300 members, and the ratio is raised regularly, while the number of members is seldom increased unless by the addition of new States. In that way the House was increased by the admission of Oregon in 1859, Kansas in 1861, West Virginia in 1863, Nevada in 1864, Nebraska in 1867, Colorado in 1876, North and South Dakota, Montana, and Washington in 1889, Idaho and Wyoming in 1890, and Utah (making the forty-fifth State) in 1896. In the various State legislatures a similar practice prevails. At stated intervals, generally of ten years intermediate with the Federal period, a reapportionment is made. This period is often taken advantage of by the party in the majority, who, by combinations of various kinds, "gerrymander" the State, and so redistrict that their opponents are in a hopeless minority at the polls on many succeeding election days.

AP'POSI'TION (Lat. *appositio*, a setting before, from *ad*, to + *ponere*, to place). A term in grammar signifying the annexing of one substantive to another, in the same case or relation, in order to explain or limit the first; as, *my brother, the physician; Thomas the Rhymer.* Whole sentences or clauses admit of apposition. Thus: "Napoleon sought the way to India through Russia, a stroke of genius." Sometimes a connecting word is used where logical propriety would require apposition; as, *the city of London,* for *the city London.*

APPRAISE'MENT (from Eccles. Lat. *appretiare*, to value at a price, to rate, from Lat. *ad*, to + *pretium*, price). The official or formal valuation of property, in accordance with legal requirements, or by agreement between the parties interested. Official appraisements in legal proceedings are regulated generally by statute, and are most frequently resorted to in the case of merchandise subject to customs duty; of the personal estate of a decedent; of property taken for public use under the right of eminent domain, or damaged by authorized public works, such as canals; of wrecked property; of property of bankrupts or insolvents; and of property levied upon under judicial process, or distrained for rent. Unofficial appraisements are often provided for by the agreement of parties interested, as in the case of insured property which is injured or destroyed. When an appraisement is duly made, in a legal proceeding or by mutual agreement, the value set upon the property is, as a rule, conclusive upon the parties interested therein.

AP'PREHEND' (Lat. *apprehendere*, to seize). To take a person into custody by warrant of law for the purpose of subjecting him to criminal process. The apprehension of the person accused of crime is not, strictly speaking, a part of the criminal process, but may precede it, or may occur at any stage in its progress prior to execution of the sentence imposed. Indeed, in some jurisdictions, it may be dispensed with altogether, where the sentence does not call for the physical punishment of the offender. In England and the United States, however, the trial of a person accused of crime cannot proceed without apprehension or personal submission of the accused to the process of the court. The term arrest (q.v.), which is, in strictness, applicable only to detention in civil cases, is now commonly employed in all cases of taking into custody.

AP'PREHEN'SION (Lat. *apprehensio*, a setting upon, grasping, understanding, from *ad*, to + *prehendere*, to seize). A term denoting the subjective aspect of perception and imagination, as presentation and representation denote their objective side. Two special uses of the word may be noticed. (1) The phrase "direct apprehension" is employed for the habitual recognition of objects and persons whose presence in our surroundings is a matter of course. We do not, in strictness, "recognize" the clothes that we put on every morning, the pen with which we write, the familiar faces of our household; there is no trace of associative supplementing, or of any well-marked mood of familiarity. Rather, we apprehend them directly. Their look and touch set up a certain bodily attitude, the attitude of easy "at-homeness"; and it is the vague, ill-defined mood of "at-homeness" which mediates the recognition (q.v.). (2) Stout has carried this reduction a step further, in his doctrine of "implicit apprehension." "It is possible," he says, "to distinguish and identify a whole without apprehending any of its constituent details." It is possible, e.g., to understand the meaning of a word—something that stands for a highly complex combination—without any mental imagery whatsoever; the meaning is implicitly apprehended by an imageless thought. There is something fascinating about this assumption of "a mode of presentational consciousness which is not composed of visual, auditory, tactual, and other experiences derived from and in some degree resembling in quality the sensations of the special senses," yet which possesses "a representative value or significance for thought"; but its assumption is unnecessary. By the law of exclusion (see ASSOCIATION OF IDEAS), the middle terms of a train of ideas may drop out, with frequent repetition; so that the idea *x*, which was at first mediated by *abcd*, is now called up by *a* alone, without the intervention of *bcd*. So the sound, or articulatory "feel," or sight of the word might come, in time, to carry the meaning which had originally been carried by associated images. Moreover, there can be no understanding, even of the most familiar word, without the arousal of the mood of "at home," with its constituent organic sensations; and there can be little doubt that these are the real vehicle of the word's meaning. Consult: G. F. Stout, *Analytic Psychology* (London, 1896); E.

B. Titchener, *Outline of Psychology* (New York, 1902).

APPREN'TICE (Low Lat. *apprenticius*, learner, from *apprehendere*, to grasp). A person, generally a minor, lawfully bound to the service of another, in consideration of maintenance and instruction by that other in some art or trade. At present the apprentice system in England and in many of our States applies chiefly to orphans or to the children of paupers, and to some extent in this country to minors who have been sent to houses of refuge or similar institutions for petty offenses. It is regulated by statutes in most of our States, and their provisions must be strictly complied with, or the apprenticeship will be invalid. Ordinarily the consent of the minor, and of his father, mother, or guardian, is required; the apprenticeship is limited to the age of 21 in the case of boys, and 18 in the case of girls, and ceases upon the death of either the master or the apprentice. By section 4509 of the United States Revised Statutes, a boy who has attained the age of 12 years may be apprenticed to the sea service, with his consent and that of his parents, such apprenticeship to cease when he becomes 18 years of age. The Thirteenth Amendment to the United States Constitution, prohibiting "slavery or involuntary servitude, except as a punishment for crime," it has been judicially declared, does not relieve an apprentice from doing service against his will. See Kent, *Commentaries on American Law* (fourteenth edition, Boston, 1896); Austin, *The Law Relating to Apprentices* (London, 1890), for the English laws; and the works referred to under the titles CONTRACT; MASTER AND SERVANT.

APPRENTICE, NAVAL. Apprentices are enlisted for the United States naval service between the ages of 15 and 17 to serve until they reach 21 years of age. Minors between the ages of 15 and 17 are not enlisted without the consent of their parents or guardians. The applicant must be of robust frame, intelligent, of perfectly sound and healthy constitution, free from all physical defects or malformation, and not subject to fits. He must also be able to read and write. In special cases, where the boy shows a general intelligence, and is otherwise qualified, he is enlisted, notwithstanding his reading and writing are imperfect. Upon enlistment boys are rated as third-class apprentices and receive $9 per month and one ration. After completing their tour of service in a cruising training-ship, if qualified, they are advanced to apprentices of the second class at $15 per month. After serving one year in cruising ships of war, if qualified, they are advanced to apprentices, first class, at $21 per month. Apprentices, first class, during the last year of their enlistment, may be given acting appointments as petty officers, third class, and if they serve the probationary period in the United States Navy, they must be recommended to a permanent appointment previous to discharge. Upon the expiration of the enlistment of an apprentice he will, if recommended, receive an honorable discharge; and upon reënlistment within four months from date of honorable discharge he will receive four months' extra pay of his rating when discharged, a continuous service certificate, and an addition of $1.36 per month to his pay. When first received on board a training-ship apprentices are furnished, free of cost, with an outfit of clothing not exceeding in value the sum of $45. This outfit is furnished on the supposition that the apprentice will serve during his minority. Should he be discharged at his own request prior to the completion of his term at the training station and the first practice cruise, he must refund the value of the outfit. As soon as practicable after the apprentices are enlisted, they are forwarded to the naval training-station at Newport, where they receive instruction in English studies and in the rudiments of the profession of a seaman, for the period of six months. At the termination of this period the apprentices are transferred to the cruising training-ships. There are three departments of instruction and training—seamanship, gunnery, and English, the last embracing reading, writing, spelling, geography, history, and arithmetic. There is also special instruction as buglers, carpenters, sailmakers, and blacksmiths. When apprentices are to be discharged their parents or guardians are informed, and ample time is allowed them to come themselves, or send means to defray the traveling expenses. The course of instruction on board the cruising training ships is of six months' duration. The instruction begun at the shore station is continued aboard the cruising vessels with an increase of practical work. When transferred to the regular service cruisers, the instruction is still continued, and the apprentices are regularly examined before being advanced in rating. Should the term of enlistment of an apprentice expire while he is abroad, he is to be sent to the United States as soon as practicable, unless he desires to reënlist.

APPROACH'ES (Fr. *approcher*, It. *approcciare*, M. Lat. *appropiare*, come near to, from Lat. *ad*, to + *prope*, near). A term used in the science of fortification, to describe the sunken trenches or passages constructed by an attacking force to cover and protect their advance on a fortified position. Care is taken in the construction of approaches, which are usually in a zigzag course, to avoid enfilade or direct fire, particularly the former. The style of approaches built will depend altogether on the character and strength of the besieged, and the time available for the work. Generally, continuous lines of breastworks are built, parallel to the opponents' lines. If excavation is difficult or impossible, breastworks of sandbags and gabions are built. Important examples of this branch of military operations are the works constructed by the French and English troops in the Crimean War of 1854, at the siege of Sebastopol, and more recently the extensive works built by the Japanese in their attack and capture of the strongly fortified and stubbornly defended position of Port Arthur. See FORTIFICATION, also SIEGE AND SIEGE WORKS.

APPRO'PRIA'TION (Late Lat. *appropriatio*, a making one's own, from *ad*, to + *proprius*, one's own). (1) The act of applying specific property to a particular use. (2) The act of reserving property for a designated use. In its first signification, the term is applied to unlawful acts, such as those of conversion (q.v.) or embezzlement (q.v.); and to lawful acts, such as the adoption of a design or symbol as a trademark, or the final setting aside of specific goods under an executory contract of sale (q.v.) for the purpose of transferring the title or ownership to the buyer. In this signification, also, it is used in the phrase appropriation of payments.

When X owes Y several debts, X has the right to appropriate a payment which he makes to any of the debts. If he pays, without exercising the right, Y may appropriate the payment to any debt. In case a payment is made without appropriation at the time, by either X or Y, and subsequently they disagree as to its appropriation, the courts will apply it in accordance with their conception of the justice of the case. These conceptions, as announced in various reported decisions, are tending toward the establishment of fixed rules. Such rules are applied, however, only to voluntary payments, of which the debtor had the power of appropriation. If, for example, a payment is made under judicial process, as upon the sale of the debtor's property under the foreclosure of a mortgage, it will be appropriated ratably toward the claims for which the mortgage was security.

In the second of the above significations, the term *appropriation* is found most frequently in constitutional and statutory provisions. By Article I, Section 9, of the United States Constitution, it is declared: "No money shall be drawn from the treasury, but in consequence of appropriations made by law." In England, "Not a penny of revenue can be legally expended, except under the authority of some act of Parliament." The most important statute of this sort is the annual Appropriation Act, by which definite sums are reserved for specified objects. See the works mentioned under the titles referred to in this article, and for appropriation by a debtor those referred to under the title: Contract; for appropriation of funds by the government see Story, *Commentaries on the Constitution of the United States* (fifth edition, Boston, 1891), and Von Holst, *Constitutional Law of the United States of America* (Chicago, 1887).

APPROVE′MENT. The inclosing, by the lord of a manor, of a part of the common (q.v.), or waste lands of the manor, for the purpose of cultivation and improvement. When the acts of approvement and inclosure are completed, the land so inclosed loses its character as common land, and is converted to the use of the lord. In general, the lord cannot exercise this right to the exclusion of rights of common, and, therefore, he can only approve a part of the common land, leaving enough of the waste to satisfy the needs of commoners. The matter is wholly regulated by statute. Consult: Pollock and Maitland, *History of English Law* (second edition, Boston, 1899), and authorities referred to under Common.

APPROX′IMA′TION (Lat. *approximare, to* approach, from *ad*, to + *proximus*, nearest). In mathematics, a process or a calculated result not rigorously exact, but approaching the truth with continually increasing exactness, or near enough for a given purpose; e.g., the process of solving a higher numerical equation by Horner's method gives a root that, as the process is extended, approaches the true root with continually increasing exactness; multiplying the diameter of a circle by 3.1416 gives the circumference near enough for most purposes. It should be remembered that a result cannot be more accurate than the data, and that in mensuration the data are not usually carried beyond thousandths of a unit; hence the great importance of approximation, even in ordinary arithmetical calculations.

APPUI, ȧ′pwē′. See Point d'Appui.

APPUN, äp′pụn, Karl Ferdinand (1820-72). A German naturalist, born at Bunzlau. In 1849 he undertook a journey of exploration to South America, where he remained for nineteen years. The three years from 1868 to 1871 he spent in his native country, after which he returned to his wanderings in South America, where his death was caused by an accident with sulphuric acid. Appun's studies were extended over a large area in Venezuela, Brazil, and British Guiana. His published works include: *Unter den Tropen, Wanderungen durch Venezuela, am Orinoco, durch Britisch-Guayana, und am Amazonenstrom in den Jahren 1849-68* (Jena, 1871).

APPUR′TENANCE (O. F. *apurtenance, apartenance*, from Lat. *ad*, to + *pertinere*, to belong). In law, an incorporeal property right, which is an incident to, and belongs with, real estate. Upon conveyance of the principal real estate, the appurtenances pass to the grantee as an incident without being expressly mentioned in the grant. An appurtenant right is the antithesis of a right in gross, which is a property right, attached to the person of the owner. It is not an incident of real estate, and may be conveyed apart from it. Appurtenances are classified as profits, or rights of common, and easements. A profit appurtenant is the right of the owner of real estate, as such, to take a profit or portion of the product from the land or water of another, as to pasture cattle, cut timber, catch fish, or the like, in common with the owner of the land. An easement appurtenant is any right of the owner of real estate, as such, in or over the land of another, which does not involve taking any profit or product from the land, as a right of way, or the right to have light and air pass over the land of another. See Easement; Profit; Servitude; and the authorities referred to under the title Real Property.

APRAXIN, ȧ-präks′ĭn, Fedor Matveyevitch (1671-1728). A distinguished Russian admiral. When hardly twelve years of age he entered the service of Peter the Great, who conceived a great attachment for him, which lasted during the life of the monarch. After the year 1700 he became the most powerful and influential person at the court of the Czar, who made him chief admiral of the Russian navy, of which in fact Apraxin may be considered the creator. While Peter was fighting the Swedes in the north, Apraxin was building war-vessels, fortresses, and wharves in the south. In 1707 he was appointed president of the admiralty; in 1708 he defeated the Swedish general Lybeker in Ingermanland, and saved the newly built city of Saint Petersburg from destruction; in 1710 he captured the important town of Viborg, in Finland, and in 1711 commanded in the Black Sea during the Turkish War. The following year he returned to the north; and in 1713, with a fleet of two hundred vessels, he sailed along the coast of Finland, took Helsingfors and Borgå, and defeated the Swedish fleet. The result of his great successes was that at the peace of Nystad, in 1721, Russia obtained possession of the coveted Baltic Provinces, and became the leading power in the Baltic Sea. In 1715, and again in 1718, Apraxin was found guilty of embezzlement and extortion, but escaped serious punishment and lost nothing in reputation. In 1722 he accompanied Peter in his Persian war, and was present at the siege of Derbend. His last naval expedition was in 1726, when he repaired with the Russian fleet to Reval, to defend that place against an expected attack by the English. He died at Moscow.

APRAXIN, Stepan Fedorovitch, Count (1702-60). A Russian general. In 1737 he served against the Turks, gaining rapid promotion, being appointed ambassador to Persia in 1742, general-in-chief in 1746, and field-marshal in 1756. In Elizabeth's court he was a strong opponent of Prussian influence, and in the Seven Years' War, as field-marshal, led an army of invasion into Prussia, defeating the Prussian field-marshal Lewald at Grossjägerndorf, 1757. In the midst of success, he retreated, at the call of Bestuzheff, who wanted to raise Paul to the Russian throne over his father (Peter III.), who was the legitimate heir, as the Empress Elizabeth fell dangerously ill. On recovering, the latter removed Bestuzheff, and put Apraxin into prison. The court-martial reported to the Empress that the prisoner denied any guilt, whereupon she recommended it to apply the last remedy—to set him free. At the next session, when Apraxin persisted in claiming innocence, the president of the court-martial urged his colleagues to apply "the last remedy." At these words, Apraxin fell in a fit of apoplexy, thinking they referred to torture.

A'PRICOT (Fr. *abricot*, Sp. *albaricoque*, Portug. *albricoque*, from Ar. *al-birqūq*, *al-burqūq*). A fruit (Lat. *Prunus Armeniaca*, i.e., Armenian plum) resembling in several respects both the peach and plum, and really intermediate between them. It is supposed to be a native of China, and was brought into Europe at the time of Alexander the Great. The flesh of the apricot is firm, sweet, and aromatic; the stone is smooth and slightly furrowed, like that of some plums. The skin is downy, like that of the peach. The tree resembles the plum more than the peach, in that it has ovate, acuminate, and cordate, smooth, double-toothed leaves, on long stalks, and solitary, sessile, white flowers which appear before the leaves. The danger of loss from frost, owing to its early blooming habit, as well as from Plum Curculio, has discouraged the cultivation of the apricot in the eastern United States. In California and Oregon it is extensively raised. In England it is a favorite with gardeners, and is grown both in the open and as espalier or cordon on protected walls. In the eastern United States, when trained in similar manner to a northern or northeastern wall, it does well, as in such a situation the buds are sufficiently retarded to escape frost. The tree is as hardy as the peach, but it has the bad habit of early blooming, characteristic of all Oriental fruits, particularly the Japanese plums.

In the eastern United States, the apricot is usually budded or grafted upon the plum. This fits it for heavy soils; on light soils, it does well when worked upon the peach, and in California, where apricot stocks can be obtained, it is worked upon the apricot itself. In New York State there are commercial orchards of apricots, top-worked on the plum. The Russian apricot is a hardy form of Prunus Armeniaca, and although not in itself of merit for its fruit, may prove to be a valuable stock for the more desirable forms. Orchard culture of the apricot is, in general, the same as for the peach. (See Peach.) Like all fruits which have been long in cultivation, the apricot has numerous varieties; some valuable varieties are Holland (Breda), Moorpark, Early Golden, and Peach. The fresh fruit of the apricot is now commonly found in the markets. Large quantities of the fruit are also dried in California and Oregon in fruit evaporators. The product is extensively shipped to different parts of the United States and abroad, for cooking purposes. For composition and food value of the fruit, see general article on Fruit. For illustration see Plate of Abutilon and Drupes.

Diseases.—The apricot is subject to the same diseases as are the peach and plum. The most common disease is the *leaf rust*. It may be prevented by the thorough use of the standard fungicides (q.v.).

APRIES, ā̆'prĭ-ēz (Gk. 'Απρίης, *Apriēs;* Uaphres, Egyptian, *Ṷaḥ-eb-rē'*). An Egyptian king of the twenty-sixth dynasty. In the Old Testament he is called Pharaoh-hophra. He reigned from B.C. 589 to 570, at the time when the Babylonians subjected Palestine and threatened Egypt. He aided the Jews in their resistance against Nebuchadnezzar, but was unable to prevent the fall of Jerusalem. Apries seems, however, to have warded off the Babylonian attack upon Egypt. The revolt of his native troops sent against the Cyrenæans in aid of the Libyan king Adikran led to the usurpation of Amasis (q.v.). Herodotus, who in general gives a strangely distorted account of Apries, relates that the usurper kept him alive for some time, until at last he was forced to yield up the dethroned king to an infuriated mob. This story is, however, not confirmed by the Egyptian inscriptions.

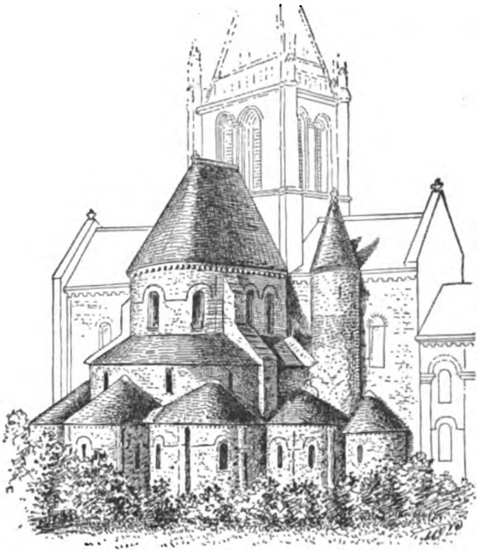
A'PRIL. See Month.

APRIL FOOL. The first of April, known as "All Fools' Day," has long been in America, and for a still longer period in many European countries, a day for mocking unwary persons by sending them on bootless errands or making them the victims of some other practical joke. The custom seems to have been unknown to German antiquity. Grimm regards it as having been introduced into Germany from France, in comparatively modern times. Various theories have been held as to the origin of the custom. One traces the custom to the miracle-play formerly represented at Easter, which sometimes showed the sending of Christ from Annas to Caiaphas, and from Pilate to Herod; another finds the origin in some ancient pagan festival where similar tricks were played, such as the Huli festival held by the Hindus on March 31, or the Feast of Fools, celebrated by the Romans on February 17. In France, the victim is called *un poisson d'Avril*, an April fish (possibly from the reopening of the fisheries at that season); in Scotland, a gowk or a cuckoo.

A PRIO'RI (Lat., from something prior, foregoing, *a*, from, and *prior*, prior). In Aristotelian terminology, a designation applied to arguments from cause to effect, as opposed to *a posteriori* (Lat., from something posterior, following), which describes arguments from effect to cause. But since Kant's day *a priori* has become an epithet, often polemic, applied to judgments alleged to have a validity independent of experience. Its antonym in this meaning is still *a posteriori*, which means resting upon experiential proof. The attitude one takes toward the question of the possibility of *a priori* judgments is one of the most crucial tests of one's affiliation among the philosophic schools. Rationalists, Intuitionalists, and Criticists (i.e., followers of Kant) maintain that many of our judgments are *a priori;* Empiricists deny it. The debate, however, seems to be conducted upon a false assumption, shared by most of the protagonists on either side, viz., that experience comes piecemeal, or, technically, is atomistic in character. If such were the case, then any valid universal judgment would have to be *a priori*, for no number of *isolated* experiences could point to a general law. But experience does not grow by the accretion of unrelated elements; rather is its growth a process of organic expansion under stimulation, which for practical purposes must be regarded as proceeding from the external world. In the knowledge thus acquired, there is the coöperation of what may be distinguished as two factors, the nature of consciousness and the nature of the stimulus that gives rise to a content in consciousness. Now, these two factors may conveniently be designated the *a priori* and the *a posteriori* constituents of knowledge. But it is of the utmost moment to guard against the error of supposing that antecedently to experience there is a thing called mind which comes to the act of experience ready equipped with either a determinate nature or with full-blown knowledge of some sort. The literature of the subject is enormous. Omitting all reference to ancient philosophers, some of the noteworthy books bearing on the topic are: J. Locke, *Essay Concerning Human Understanding*, best edition, by Fraser, 2 vols. (Oxford, 1894); Leibnitz, *Nouveaux essais sur l'entendement humain*, English by Langley (New York, 1896); also selections translated by Duncan (New Haven, 1890), and by Latta (Oxford, 1898); D. Hume, *Treatise of Human Nature*, Book i., part iii. (Selby-Bigge ed., Oxford, 1888); id., *An Enquiry Concerning Human Understanding* (Selby-Bigge ed., Oxford, 1894); Kant, *Kritik der reinen Vernunft*, English by Max Müller (London, 1896); Hegel, *Encyclopädie der philosophischen Wissenschaften im Grundrisse* (Heidelberg, 1830), in part translated into English by Wallace under the titles, *Hegel's Logic* (Oxford, 1892-94) and *Hegel's Philosophy of Mind* (Oxford, 1894); R. H. Lotze, *Logik* (Leipzig, 1880), edited in English by B. Bosanquet, 2 vols. (Oxford, 1888); J. S. Mill, *Logic* and *Examination of Sir W. Hamilton's Philosophy* (London, 1867; last in author's lifetime, 1872); E. Caird, *A Critical Account of the Philosophy of Kant*, 2 vols. (New York and London, 1889); F. H. Bradley, *Principles of Logic* (London, 1883); B. Bosanquet, *Logic* (Oxford, 1888); L. T. Hobhouse, *Theory of Knowledge* (London, 1896). See also KANT; DEDUCTION; INDUCTION; LOGIC; EMPIRICISM; and TRANSCENDENTALISM.

A'PRON (by wrong division into *an apron* for *a napron*, O.E. *napron*, O.F. *naperon*, Fr. *napperon*, dimin. of *nappe*, cloth, tablecloth, from Lat. *mappa*, cloth, cf. *napkin*). An outer garment, originally of linen, but often of cloth or leather, covering the front of the person and intended to protect other clothes from injury. It is used in Coverdale's translation of the Bible (1535), and also in the Authorized Version, to render the Hebrew word *chagorah*, applied to the covering of fig-leaves made by Adam and Eve after the Fall. It has also been applied to various mechanical devices used for purposes of protection, as (1) in military affairs, a rectangular piece of lead, with a projection on the under side, used to cover the vents in old-fashioned cannon; (2) in ship-building, the piece of curved timber set just above the forward end of the keel, to join the several pieces of the stem and connect them more firmly with the keel (see SHIPBUILDING); (3) in engineering structures, a platform placed at the base to protect it from heavy shocks; (4) in carpentry, the horizontal piece of timber which takes a carriage-piece or rough string on a staircase, and also the ends of joists which form the half-space or landings; (5) in plumbing, the lead sheeting or flushing dressed on the slates in front of a dormer window or skylight; (6) in mechanics, the piece which holds the cutting tool in a planing machine; (7) in architecture, a more or less flat member placed against or above anything for protection, as the decorative member under a veranda cornice. Besides the obvious uses of aprons in the original sense, they are also worn in elaborately decorated forms, as part of the costume of Freemasons (see MASONS, FREE) in the lodge; and bishops and deans in the Church of England wear an apron of black or purple silk which is an abbreviation of the older cassock.

APSE. (For derivation, see APSIDES.) An architectural term used by Greeks and Romans to designate a vaulted structure, such as a domical chamber, or even a triumphal arch. The Romans applied it particularly to the large, semicircular niche that projected from some of their temple-cellas or their basilicas; in the temples, it was the place for the cult-image of the god; in the basilica, it was the prætor's tribunal, where he sat surrounded by his assessors. In both cases it was the culminating point of the structure. The partial derivation of the Christian church or basilica from the Roman basilica or law-court makes it natural that this semi-circular projection or apse should appear as an integral part of the earliest churches; Early Church writers also called it *exedra*, *concha*, or *conchula bematis*. Being opposite to the façade, which usually faced west, the apse end of the church was often called the east end. The higher clergy were seated on a bench around the apse; the bishop took the prætor's place in the centre, and the presbyters that of the assessors. The altar rose just beyond the centre of the semicircle. Being the most sacred part of the church, the apse received the richest and most artistic decoration, and the most sacred subjects were depicted upon its semidome and walls. The width of the apse usually corresponded to that of the nave of the church, whose end it seemed to form. It was not until the Seventh or Eighth century that two smaller apses were often placed on either side to stand in the same way at the ends of the aisles. They may have developed from the small sacristies which had for centuries usually been placed there.



APSE AND APSIDIOLES.

Churches without apses are very few. But in course of time variations of form were introduced. Byzantine architects gave a polygonal form to the exterior, while preserving the interior semicircular outline (e.g., Ravenna). Square apses, found at first only as out-of-the-way freaks, became common in the Eleventh, Twelfth, and Thirteenth centuries, especially as they were adopted by the Cistercian monks and those who felt their influence. The development of transepts led sometimes to the use of apses at their terminations, as in the Romanesque churches at Cologne. Another arrangement, seldom seen outside of Germany, was a double apse, one at each end of the church, which made it necessary to enter the church at the sides; this is found in both Romanesque and Gothic churches. Finally, the apsidal end of the Romanesque church, first in France and then in Germany, became enriched by the use of radiating chapels and side-aisles, taking a form which is no longer called apse, but choir, and is described under that head. The exterior wall of the apse was very plain in early Christian architecture, but mediæval art decorated it richly with false and engaged arcades in several rows.

APSHERON, äp′shâ-rôn. A peninsula of Russia on the western shores of the Caspian Sea (Map: Russia, G 6). It is famous for its immense deposits of naphtha, probably the richest in the world. The soil is sterile, and strong winds prevail. See BAKU.

AP′SIDES, ăp′sī-dēz (Gk. plur. of ἀψίς, *apsis*, loop, juncture). The two extreme points in the orbit of a planet—one at the greatest, the other at the least distance from the sun. The term apsides is applied in the same manner to the two points in the orbit of a satellite—one nearest to, the other farthest from, its primary; corresponding, in the case of the moon, to the perigee and apogee. A straight line connecting these extreme points is called the line of apsides, or the major axis of the orbit. In the planetary orbits, this line has no fixed position in space, but undergoes a motion in the plane of the orbit. This fact in the orbit of the earth gives rise to the difference between the anomalistic (q.v.) and sidereal years. This motion of the line of apsides is especially remarkable in the orbit of the moon, an entire revolution taking place in 3232.57 days, or a little less than nine years.

AP′SLEY HOUSE. The mansion built by Lord Bathurst in 1785, and purchased in 1820 by the Government for the Duke of Wellington in reward for the latter's services to the nation in the Napoleonic wars. In 1830 its windows were broken by the mob on the anniversary of Waterloo, and the Duke was forced to have them protected by iron shutters.

APT, äpt (anciently, Lat. *Apta*). The capital of the arrondissement of the same name, in the department of Vaucluse, France, on the Mediterranean Railway (Map: France, M 8). It contains a communal college, library, meteorological station, and a number of manufacturing establishments. Its cathedral is supposed to have been built about the Eighth Century, and it contains numerous specimens of Romanesque architecture. In ancient times Apt was the chief city of the Vulgientes and received much attention from Julius Cæsar, who gave it the name of Apta Julia. It came into the possession of France in 1481. Population, 1901, 5948.

AP′TERAL ("having no wings," Gk. ἀ, *a*, priv. + πτερόν, *pteron*, wing). A term applied to Greek and Roman temples without lateral colonnades, or *pteromata*, outside the *cella;* and also to Christian churches which either had no aisles or whose façades had the form of a single unbroken gable, not divided into three sections.

AP′TERYG′OTA. A prime division of Insecta, embracing primitive insects without wings, and including the Thysanura and Collembola. See BRISTLETAIL and SPRINGTAIL.

AP′TERYX (Gk. ἀ, *a*, priv. + πτέρυξ, *pteryx*, wing). The type genus of a sub-class or group of small wingless ratite birds of New Zealand, akin to the epiornis and other ancient ostrich-like birds. The species of the genus Apteryx were called by the Maoris "kiwi-kiwi." See KIWI.

AP′THÆ. See APHTHÆ.

AP′THORP, WILLIAM FOSTER (1848—). An American writer and musical critic, born in Boston, Mass. He graduated at Harvard in 1869 and studied music under J. K. Paine and B. J. Lang. He is well known as the author of *Hector Berlioz: Selections from His Letters and Writings*, with a biographical sketch, a pioneer work in English on this composer; and books of musical criticism, including *Musicians and Music Lovers* and *The Opera, Past and Present*. He has lectured at the Lowell Institute, Boston, and the Peabody Institute, Baltimore, and has taught at the New England Conservatory, Boston, and the College of Music of Boston University. From 1892 to 1901 he wrote the analyses of musical compositions which appeared in the programme of the Boston Symphony Orchestra. In 1881 he became musical critic of the Boston *Transcript*.

APULE′IUS, LUCIUS. A satirical writer of the Second Century. He was born at Madaura, in Africa, where his father was a magistrate, and a man of large fortune. Apuleius first studied at Carthage, which at one time enjoyed a high reputation for its school of literature. Afterward he went to Athens, where he entered keenly upon the study of philosophy, displaying a special predilection for the Platonic School. The fortune bequeathed to him at his father's death enabled Apuleius to travel extensively. He visited Asia and Italy, and was initiated into numerous religious mysteries. The knowledge which he thus acquired of the priestly fraternities, he made abundant use of afterward in his *Golden Ass*. His first appearance in literature arose from a lawsuit. Having married a middle-aged lady, named Pudentilla, very wealthy, but not particularly handsome, he drew down upon his head the malice of her relatives, who desired to inherit her riches, and who accused the youth of having employed magic to gain her affections. His defense (*Apologia*, still extant) spoken before Claudius Maximus, proconsul of Africa, was an eloquent and successful vindication of his conduct. After this event his life appears to have been devoted zealously to literature and public oratory, in both of which he attained great eminence. He was extremely popular, so that Carthage and other cities erected statues in his honor.

The *Metamorphoses*, or *Golden Ass*, the work by which his reputation has survived, is a romance or novel, whose principal personage is one Lucian, supposed by some, though on insufficient evidence, to be the author himself. It is generally understood to have been intended as a satire on the vices of the age, especially those of the priesthood, and of quacks or jugglers affecting supernatural powers, though Bishop Warburton and other critics fancied they could detect in it an indirect apology for paganism. Its merits are both great and conspicuous, as are also its faults. Wit, humor, satire, fancy, learning, and even poetic eloquence abound; but the style is disfigured by excessive archaisms, and there is a frequent affectation in the metaphors, etc., which proves Apuleius to have been somewhat artificial in his rhetoric. The most exquisite thing in the whole work is the episode of Cupid and Psyche (imitated by La Fontaine; separate edition by Jahn, Leipzig, 1856). It is supposed to be an allegory of the progress of the soul to perfection. Besides the *Apologia* and *Golden Ass*, we have from the pen of Apuleius an anthology in four books, a work on the dæmon of Socrates, one on the doctrines of Plato, one on *The Universe*, etc. A considerable number of his works are lost. The most recent and careful edition is by J. van de Vliet, the *Metamorphoses* (Leipzig, 1897); *Apologia* and *Florida* (Leipzig, 1900). The *Golden Ass* was translated into English by T. Taylor (London, 1822), and again by Sir G. Head (London, 1851). A still earlier translation by Adlington in 1566 has been republished, in an introduction by Whibley (London, 1893). An English version of the works of Apuleius was published in London, 1853.

APU'LIA. A part of ancient Italy lying along the Adriatic Sea, and bounded on the west and south by the Frentani, Samnium, Lucania, and Calabria (Map: Italy, L 6). Modern Apulia (Ital. *Le Puglie*) comprises the provinces of Bari, Foggia, and Lecce. It is a vast plain drained by numerous small streams flowing toward the Adriatic. The country has extensive areas of pasture land, and the raising of domestic animals is the chief occupation of the inhabitants. Chief towns: Bari, Brindisi, Foggia, and Lecce. Population, 1881, 1,519,064; 1901, 1,949,423. According to old poetic traditions, Daunus, King of the Apulians, when banished from Illyria, had come and settled here. The chief towns of Apulia were Arpi, Barium, Canusium, Luceria, and Venusia (birthplace of Horace). The Romans first came in contact with the Apulians in B.C. 326, when a friendly alliance was formed; but the Apulians joined the Samnites, the Tarentines, and finally Hannibal in attempts against Roman supremacy. Much of the Second Punic War was fought in Apulia, and here the Romans lost the disastrous battle of Cannæ (q.v.). After the fall of Hannibal, Apulia was wholly subjugated by Rome. When Augustus divided Italy into districts, the *Regio II.* was made to include Apulia and Calabria.

APURE, ä'po͞o-rā'. An important tributary of the Orinoco, rising in the eastern slopes of the Andes near Bucaramanga, in Colombia, South America. Flowing eastward, it enters Venezuela, receiving from the south the Caucagua River and from the north the Portuguesa, the Guarico, and others; finally joining the Orinoco 200 miles above Ciudad Bolivar. It is more than 700 miles long, navigable through the greater part of its course. The vessels of the Orinoco Steamship Company ply its waters.

APURIMAC, ȧ-po͞o'rē-mäk' (Peruvian *upu*, principal, chief + *rimac*, oracle). A Peruvian river, one of the head streams of the Ucayale (q.v.) (Map: Peru, C 6). It rises in the high Andes in lat. 15° S., about one hundred miles northwest of Lake Titicaca, and flows northwest throughout about five hundred miles of its course, but after uniting with the Perene it flows under the name of Tambo eastward and then northward for a distance of a hundred miles to its place of union with the Quillabambi, to form the Ucayali, which in turn, uniting with the Maranon, forms the Amazon. The Apurimac possesses the peculiarity that its tributaries, the chief of which are the Pampas, Mantaro, and Perene, are received from the west side. Among the tributaries of the Amazon, the Apurimac probably rises nearest to the Pacific Ocean. The Apurimac and its tributaries are of the nature of great mountain torrents, and their rocky and rugged banks are generally difficult of access, and ofttimes wholly inaccessible. The valleys through which they flow vary in climate and productiveness with change of altitude. The lower valleys yield the products of the tropics, and the upper ones those of temperate and cold climates. The basin of the Apurimac, as a whole, is said to be the finest part of Peru, and to contain the largest proportion of native population—the best specimens, apparently, of the aboriginal civilization.

APURIMAC. A department of Peru, bounded by the department of Cuzco on the north and east and Ayacucho on the south and west (Map: Peru, C 6). Area, 8,189 square miles. The surface is largely elevated and well watered. The population was officially estimated in 1896 at 177,387. Capital, Abancay.

A'QUA (Lat., water). A term often used by the alchemists, who called nitric acid *aqua fortis;* alcohol, *aqua vitæ*, etc. A mixture of nitric and hydrochloric acids is still called *aqua regia*. In modern pharmacy the word is used in the following terms: *Aqua ammoniæ* (water of ammonia), *aqua ammoniæ fortior* (strong water of ammonia), *aqua amygdalæ amaræ* (bitter almond water), *aqua anisi* (anise water), *aqua aurantii florum* (orange-flower water), *aqua camphoræ* (camphor water), *aqua chlori* (chlorine water), *aqua chloroformi* (chloroform water), *aqua cinnamomi* (cinnamon water), *aqua creasoti* (creosote water), *aqua destillata* (distilled water), *aqua fœniculi* (fennel water), *aqua hydrogenii dioxidi* (peroxide of hydrogen solution), *aqua menthæ piperatæ* (peppermint water), *aqua menthæ viridis* (spearmint water), and *aqua rosæ* (rose water).

AQUÆ SEX′TIÆ (Lat., Sextian waters). A town of ancient Gaul, famous for the victory of Marius over the Teutones, Ambrones, and other German tribes, in B.C. 102. It is now known as the French town of Aix, in Provence.

AQUÆ SO′LIS (Lat., waters of the sun). Now the English town of Bath; an ancient Roman city, remarkable for its magnificent edifices and for the medicinal property of its springs. Recent excavations at its site have brought to light the remains of many Roman bath-houses.

AQUAMARINE, -mȧ-rēn′ (Lat. *aqua*, water + *marinus*, belonging to the sea). A bluish-green variety of beryl that is used as a gem. It is found in a number of localities in the United States, the richest-colored gems coming from Royalston, Mass. A celandine green variety of apatite is also called aquamarine.

AQUA RE′GIA (Lat., royal water). A name given to a mixture of nitric and hydrochloric acids, which may be used as a solvent for gold, whence its name, as gold was called by the alchemists the king of metals. It is usually prepared by mixing one part of nitric acid with from three to four parts of hydrochloric.

AQUA′RIUM (Lat., a watering-place for cattle, from *aqua*, water). A tank or vessel containing either salt or fresh water, in which either marine or fresh-water plants and animals are kept in a living state. From 1854 to 1860 there was a mania for these scientific toys, and they became not only an aid to study, but a source of rational amusement, depending in principle upon the relations discovered by science between animal and vegetable life, and particularly upon the consumption by plants under the action of light of the carbonic-acid gas given forth by animals, and the consequent restoration to the air or water in which they live of the oxygen necessary for the maintenance of animal life. The aquarium must, therefore, contain both plants and animals, and in something like a proper proportion. Zoöphytes, annelids, mollusks, crustaceans, and fishes may thus be kept in health and their habits observed. The water must be frequently aerated, which can be accomplished by taking up portions of it and pouring them in again from a small height. The fresh-water aquarium is frequently provided with a fountain, which produces a continual change of water; but even where this is the case, the presence both of plants and animals is advantageous to the health of both. When sea water cannot be easily procured for the marine aquarium, a substitute may be made by mixing with rather less than 4 quarts of spring water 3½ ounces of common table salt, ¼ ounce of epsom salts, 200 grains troy of chloride of magnesium, and 40 grains troy of chloride of potassium. With care the water may be kept pure for a long time. No dead animal or decaying plant must be permitted to remain in it. Salt water, artificially prepared, is not fit for the reception of animals at once; but a few plants must first be placed in it, for which purpose some of the green algæ, especially species of Ulva, are most suitable. The presence of a number of mollusks, such as shore snails, is necessary for the consumption of the continually growing vegetable matter, and of the multitudinous spores, particularly of algæ, which would otherwise soon fill the water, rendering it greenish or brownish, and non-transparent, and which may be seen beginning to vegetate everywhere on the pebbles or on the glass of the tank. In a fresh-water aquarium, pond-snails, such as species of Lymnæa or Planorbis, are equally indispensable. For large aquaria, tanks of plate glass are commonly used; smaller ones are made of bottle-glass or crystal.

Aquaria should be placed where they have sufficient access to good light. This is, of course, essential to the green plants, and will also prevent the excessive growth of dangerous fungi. The gills of fishes, their eyes, and any wound on the body are frequently attacked by these fungi. These can often be removed in the case of fresh-water forms by a temporary bath in a common salt solution, sufficiently strong, and for a sufficient length of time to kill the fungi. The fish, although severely affected by the salt, will revive upon being flushed with an abundance of fresh water. The plants or animals with which the aquarium is to be stocked must vary with the tastes and purposes of the individual. Among fishes, the goldfish (q.v.) stands first in beauty, variety of fantastic forms, and in tenacity of life. The sticklebacks (q.v.) are desirable because of their small size and their interesting nest-building and breeding habits. Besides these, many others could be added. Crabs and anemones are common objects in marine aquaria. Notable large public aquaria are maintained in various cities of Europe for the instruction and amusement of the people. From a scientific standpoint, the aquaria at the Naples Marine Station have been of great importance. In Great Britain, the Brighton Aquarium has long been prominent, and of much service to science as well as public entertainment and instruction. In America, the aquarium of the United States Bureau of Fisheries at Washington, D. C., and the New York City Aquarium are worthy of mention. The latter was installed in old Fort Clinton, on the Battery, long known as Castle Garden, where in 1897 it was perfected by Dr. Tarleton Bean. It has seven great floor-tanks, or pools, and nearly one hundred wall-tanks, lighted from above and in the rear, and disposed in two tiers, the upper viewed from a gallery. Both marine and fresh-water fishes and other aquatic animals are displayed, and the mechanical arrangements are of the highest excellence. It is sustained by the city, under the control of the New York Zoölogical Society, and is entirely free to the public.

AQUA′RIUS (Lat., the water-bearer). The eleventh sign of the zodiac, through which the sun moves in parts of the months of January and February. It is also the name of a zodiacal constellation, whose position in the heavens may be found by producing a line in a southerly direction through the stars in the head of Andromeda and the wing of Pegasus.

AQUAT′IC ANI′MALS. See DISTRIBUTION OF ANIMALS.

AQUATIC PLANTS. A term applied to many widely distributed plants that live either wholly or partly in water. Some aquatic plants have their inflorescence, and even part of their foliage, above the surface of the water; others are in water entirely; still others are attached by roots to the bottom. The algæ, which are exclusively aquatic, seem adapted to perform under water all the functions of their life. Aquatic plants are generally of less compact structure than plants belonging to other classes, and are therefore better adapted for rising in their growth toward the surface of the water. But many of them, including some of the algæ, are also provided with air-bladders of considerable magnitude, as may be seen in some of the common seaweeds. Some of the more common aquatic plants are shown in the accompanying plate and deserve brief descriptions.

Cat-Tail (*Typha latifolia*), sometimes called bulrush, grows to the height of five or six feet. Its root-stocks are astringent and diuretic, and abound in starch. Its young shoots are much eaten by the Cossacks of the Don, and are sometimes used in England under the name of "Cossack asparagus." Its pollen is inflammable, and has been used as a substitute for lycopodium.

Long-leaved Pondweed (*Potamogeton luceus*) is one of some 65 species and a number of varieties, included in the genus Potamogeton, which belongs to the natural order Naiadaceæ. The long-leaved pondweed has thin elliptical leaves that float on the surface of ponds or slow streams. It is indigenous to the United States and is found from New Brunswick to Washington, and south to Florida and California.

American Lotus (*Nelumbium luteum*), also known as yellow nelumbo, yields edible tubers and seeds. The seeds are sought after by children, and the farinaceous roots are agreeable when boiled. The plant is found as far north as Ontario.

Water Hyacinth (*Eichhornia crassipes*, or *Eichhornia speciosa*), which belongs to the natural order Pontideriaceæ, occurs in tropical and subtropical streams of the American continents, being a native of tropical South America, and is widely cultivated in Europe. It is capable of growing on marshy banks, but attains a much larger size when floating on the water, as it usually does, without being attached to the bottom. The rosettes formed by its leaves above the surface of the water are sometimes no less than two feet high. The rapidity with which they multiply may be seen from the fact that, within a few years after having been introduced for the purpose of beautifying Saint John's River, in Florida, they threatened to render navigation on the river an impossibility. Great masses of these plants accumulate along the shores and are often driven by wind and current until they form obstructions extending over the entire breadth of the river, and through which not only small boats, but even paddle-wheel steamers, cannot penetrate. Such obstructions have developed in northern South America, and, as already stated, on Saint John's River and its tributaries in Florida. An agent of the United States Department of Agriculture, who undertook, in 1897, to investigate the danger thus caused to navigation in Florida, came to the conclusion that perhaps the best way of exterminating the nuisance is to spread among the water hyacinths their natural enemies, the water weeds, or water pests (*Philotria Canadensis*); further, to disseminate among them some virulent disease capable of destroying them; and finally, to reconstruct the bridges, so that the mass of obstructing plants may be freely carried out into the ocean.

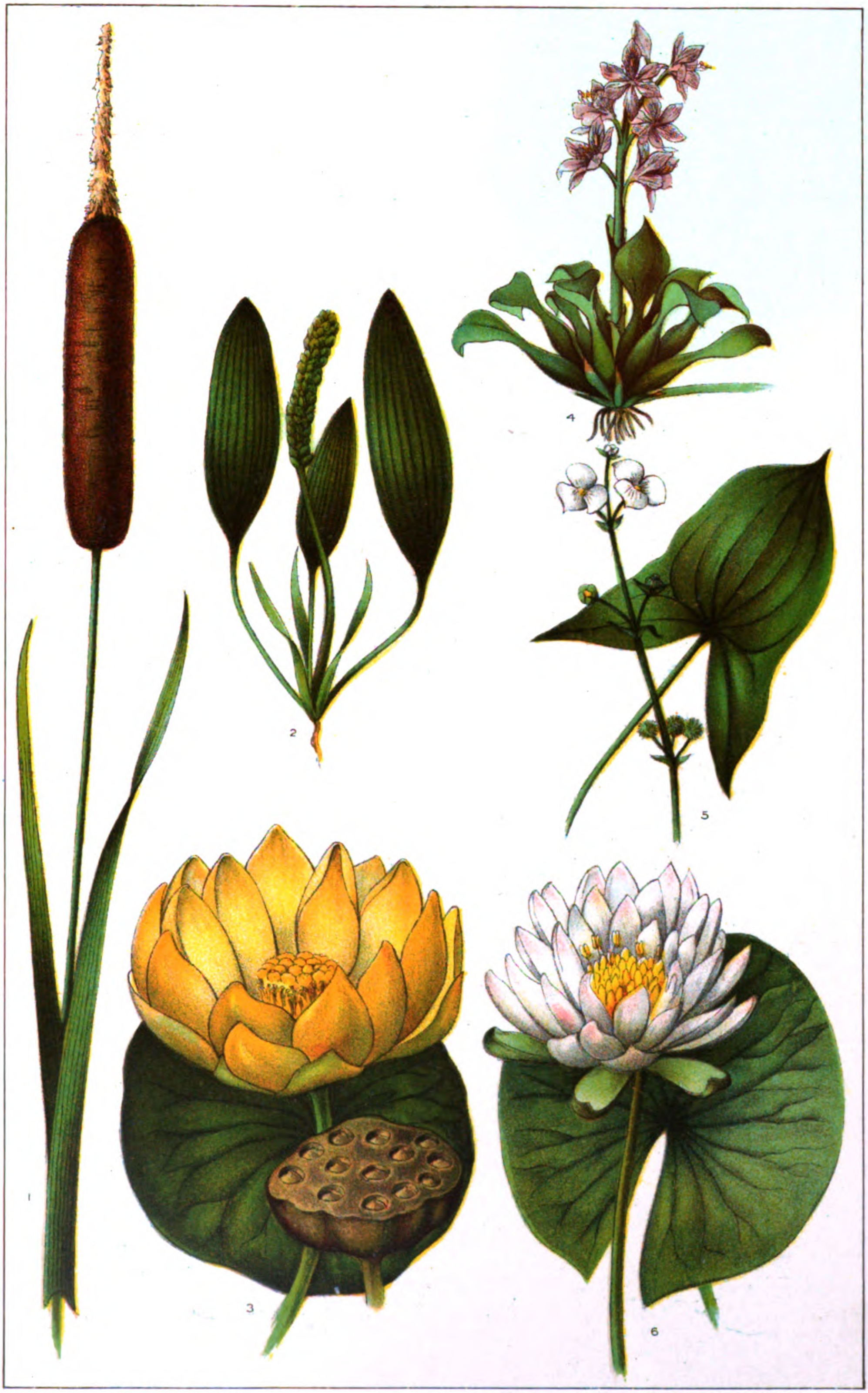
Common Arrowhead (*Sagittaria sagittifolia*, or *Sagittaria variabilis*) is a widely distributed, beautiful, white, scentless plant. It is indigenous to North America, where it extends as far south as Mexico, being found in shallow waters throughout the United States and Canada. The name Arrowhead, or Sagittaria, is extended not only to the common American plant, but to an entire genus of aquatic plants belonging to the natural order Alismaceæ. The generic name of these plants refers to the shape of their leaves. The plants include natives of both cold and warm climates, and are distinguished by unisexual flowers having three herbaceous sepals and three colored petals, with numerous stamens and carpels. This species is also a native of Europe and Asia. The Chinese arrowhead, *Sagittaria Sinensis*, has long been cultivated in China and Japan for its edible corms, which abound in starch. It is grown in ditches and in ponds, and has arrow-shaped, acute leaves and a branched polygonal scape (leafless stem). A large number of species and varieties of arrowhead are native in American waters, and fossil forms of the genus have been recognized in the Tertiary rocks of northern and middle Europe.

Water-Lily (*Nymphæa odorata*), often called the "sweet-scented water-lily," has a large white flower of great beauty and of very sweet smell. Its home is North America. Besides this plant, the name water-lily is commonly applied to other species of Nymphæa, or Castalia, as well as to plants of the genera Nuphar and Nelumbo, all of which belong to the natural order Nymphæaceæ. Great Britain produces three species, viz., *Nymphæa alba* (the white water-lily), *Nuphar luteum*, and *Nuphar minimum* (yellow water-lilies); all these have heart-shaped leaves floating on the water, those of the yellow lilies being raised by the stalks a little above the surface. The seeds of these species, as well as those of the water-lily of the Nile (*Nymphæa lotus*), are farinaceous and are sometimes used as food. The stems of Nuphar luteum are used by the Turks in making a refreshing beverage.

Consult: Britton and Brown, *Illustrated Flora of the Northern United States, Canada, and the British Possessions* (New York, 1896). The structural characters of aquatic plants are discussed at some length under Hydrophytes. See also Benthos; Halophytes; Mangrove Swamp; Plankton; and Swamp.

A'QUATINT (It. *acqua*, Lat. *aqua*, water + *tinta*, dyed). A kind of engraving on copper invented in 1760 by Jean Baptiste Leprince. The process is not unlike that of mezzotint, but produces more rapid results. After the outline of objects has been traced, the plate is covered with a layer of fine sand or powdered rosin, over which the passing of aqua-fortis produces a fine graining, which renders easy an imitation of aquarelles in sepia, India ink, or umber. The aquatint has been used successfully in pictures as an element of expression, affecting the physiognomy of things by producing shadows, and deepening and spreading color.

AQUATIC PLANTS



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1 CAT-TAIL — TYPHA LATIFOLIA
2 PONDWEED — POTAMOGETON LUCENS
3 AMERICAN LOTUS — NELUMBIUM LUTEUM
4 WATER HYACINTH — EICHHORNIA SPECIOSA
5 ARROWHEAD — SAGITTARIA SAGITTIFOLIA
6 WATER-LILY; POND-LILY — NYMPHÆA ODORATA

AQUA TOFANA, tō-fä′nȧ (Lat. *aqua*, water, of Tofana; see below). A poisonous liquid described as a clear, colorless, tasteless, and odorless fluid, a few drops of which were sufficient to produce death, which resulted slowly and without pain or fever, under a constant thirst, and weariness of life, and an aversion to food, the strength of the victim diminishing gradually. It is said to have been invented by a Sicilian woman named Tofana, who lived about 1650-1730. She sold the preparation in vials marked "Manna of Saint Nicholas of Bari," and it was much sought after by young wives who wished to get rid of their husbands. It is now believed to have been a preparation of arsenic.

AQUAVIVA, ä′kwȧ-vē′vȧ, CLAUDIO (1543-1615). The fifth general of the Jesuit Order, appointed in 1581. He was noted for his attempt to increase the importance and effectiveness of the order through the enforcement of a rigid and uniform system. To this end he wrote *Ratio Studiorum Societatis Jesu* (1592, revised edition, 1599), and *Directorium Exercitiorum Spiritualium* (1599).

AQ′UEDUCT (Lat. *aquæ ductus*, a conduit of water). Broadly speaking, this word means any conduit for conveying water, but usage, both ancient and modern, has practically limited the word to masonry conduits with little or no more slope than is necessary to cause the water to flow through them by gravity. Such limitations generally exclude mere channels or ditches (canals) in the natural earth, on the one hand, and closed conduits (pipes) under pressure, on the other. Modern aqueducts are occasionally, but rarely, under low pressures, and frequently sections of iron or steel pipes under heavy pressure are used to convey the water of an aqueduct beneath a deep valley. Inverted siphons, as these depressed sections are called, are the modern substitute for the aqueduct bridges of earlier days, or for the circuitous routes necessary to avoid the construction of such bridges. Siphons were not unknown to the Romans, who lacked, however, knowledge of cast-iron pipe, or any other pipe of large size, capable of conveying water under heavy pressure. The general abandonment of the masonry aqueduct for conduits or pipe lines of cast or wrought iron, steel and wood, has resulted from a variety of causes, such as shorter routes, due to the possibility of taking the most direct path with little regard to hills, valleys, and streams; smaller conduits, due to the increased velocity that accompanies higher pressures; and a consequent diminution in the cost of rights of way, labor, and material. Marked characteristics of the modern aqueducts have been great boldness and freedom in the use of the tunnel, and also in the employment of long-span arches for aqueduct bridges, or the substitution of iron or steel (at present the latter) for masonry bridges. In a few recent instances, where water free, or nearly free from pressure, was to be conveyed, vitrified clay pipes have been employed.

Bearing in mind the foregoing, a brief review of some of the most notable masonry aqueducts of ancient and modern times will be given. Ancient Oriental peoples, such as the Persians and Phœnicians, used a system of subterranean channels of masonry with vertical shafts at intervals, such as Polybius described (x. 23, 3) for Hecatompylos, the capital of the Arsacidæ. The Pelasgic and Mycenæan cities, such as Mycenæ and Argos, were thus supplied. Herodotus describes, as one of the most remarkable works of Greek lands, the aqueduct of Samos, built by the engineer Eupalinos with a gallery eight feet square. He also saw at Tyre three aqueducts with arches and viaducts which were imitated at Carthage before the Roman conquest. The early Latin tribes in Italy continued the Pelasgic tradition, as is shown in the famous emissary of the Alban Lake. The water supply of Athens and its plain can still be studied in a variety of conduits and aqueducts earlier than Hadrian's more striking constructions. The custom of subterranean aqueducts was at first also followed by the Romans, whose Appian aqueduct had less than three hundred feet supported on arcades above ground. Gradually, with the increase of monumental splendor, combined with the desire to carry the water to the higher level of the hills of Rome, a larger percentage of the aqueduct was arcaded, and the water brought from a greater distance.

The principle of the inverted siphon was used in such aqueducts as those of Patara, Pergamum, and Aspendos, in Asia Minor, at Constantinople, at Tebessa in Africa, and at Lyons, where it can be studied in great detail; but Vitruvius (vii. 6), in describing this method, warns against it in the case of large volumes of water, whose pressure would not be withstood by the lead or terra-cotta pipes then in use. In a few cases expensive bronze pipe is used to resist pressure. The careful grading of the aqueduct to prevent a too rapid flow was assisted by curves in the line of construction. This explains apparent peculiarities in direction. Tunnels were often cut, sometimes over three miles long. The fall recommended by Vitruvius is six inches in every one hundred feet, but it was usually greater. At the head of the aqueduct a large reservoir or *piscina* was established; minor basins were constructed at intervals along the line for filtering and clarifying the water by passing it through gravel. The channel for the water, or *specus*, between two and four feet wide, and four and one-half and six and one-half feet high, was originally of stone, lined with hydraulic cement; afterwards of concrete faced with brick. At frequent intervals were blowholes through the top or sides, to afford ventilation and access to the interior, and their place was taken in the subterranean sections by inspection wells, or *putei*. The channels were large enough to admit the workmen along their entire length for inspection and repair. Leakages were frequent, and the heavy lime incrustations, if not periodically removed, gradually reduced the size of the channels and the amount of the supply. In many cases several water supplies were carried on the same arches, being joined at a certain distance from their source, and each water being usually carried in its separate channel. This is the case with the Marcia, which carries also the Tepula and the Julia.

At the city end of the aqueduct an enormous reservoir was constructed called a *castellum aquarum*, where the water was cleared by passing through several chambers, and from which it was then distributed over the city. These *castella* were sometimes, as in the case of the

Claudia and the Alexandrina, at Rome, important artistic structures. Here there were separate purifying and storing compartments for each class of structures supplied; in the Republican period there were only three—public fountains, baths, and private houses. But under the Empire the subdivision became much more elaborate. Certain very large single buildings, such as baths, had separate reservoirs, or tanks. The water was carried into private or public buildings by lead pipes through an official bronze joint stamped with its exact capacity, and serving as a meter. The conservation and regulation of the water supply, the exact allowance to individuals, corporations, and public buildings, was secured by a very careful administration of the water-works. This care was not only applied in Rome itself; but was coextensive with the entire line of aqueduct as it was tapped at intervals and used by towns, settlements, and private owners for drinking and irrigation. To assist the administration, a strip of land thirty feet wide was reserved along the entire course, as government property, and marked by boundary stones at intervals of two hundred and forty feet. The administration was under the care of the censors, and then of the quæstors and ædiles; but under Augustus the bureau was better organized, and put in charge of a *Curator Aquarum*, with his two assistants, his clerks, his consulting engineer, and his various classes of officials and of artisans comprising a *familia* of slaves: ushers, lictors, and criers, as well as pipe-layers, pavers, masons, levelers, measurers, inspectors, reservoir keepers, etc. As usual with Roman buildings, the aqueducts were built by contract, and the use of unskilled labor made their cost relatively small. The Appia is said to have cost $675,000. The repairing of the Appia and Anio Vetus, and building of the Marcia in B.C. 144-140, cost only about $850,000. Under the more lavish Empire the Claudia and the Anio Novus cost about $4,000,000, but none of the others were as expensive as these.

Among the Roman aqueducts, those of Rome itself possess the greatest interest, because of their number, length, and boldness of design and execution. Two of them, in fact, are still in use, and water from the very source that supplied one of them (Marcia) is now delivered to the city through a modern water-works system. Not only are they in remarkable preservation, but, most happily for engineers and archæologists alike, they are described in some detail by a Roman engineer who was water commissioner of Rome in A.D. 97, named Sextus Julius Frontinus, in his *Two Books on the Water Supply of Rome*. This work was first made available to English readers in 1899, through a translation by Mr. Clemens Herschel, an American hydraulic engineer, who gives not only the Latin text, but also a photographic reproduction of the oldest Latin MS. in existence, in the library of the Benedictine monastery at Monte Cassino. Besides all this, the book in question contains several chapters of comment by the translator, both on the aqueducts and the water supply of Rome in general. Mr. Herschel concludes that the capacity of the ancient Roman aqueducts has been greatly overrated, and that, instead of the 400,000,000 gallons a day given by some writers, based on Frontinus's calculations, "thirty-eight million gallons one day with another" is "a fair estimate at which to set the water supply within the walls of ancient Rome in A.D. 97, though the total ranged, no doubt, some 20,000,000 gallons per day either side of that mark from time to time. This would make about thirty-eight gallons per day per inhabitant, which is still a very large figure when use alone, not waste, is taken into account; and when, further, we consider that by far the greater part of the people undoubtedly used only such water as was carried to their homes in jars on the heads of slaves and other women." Still, Frontinus describes nine aqueducts in use in his day, the main facts regarding which may be summarized as follows:

(1) *Aqua Appia*, built by and named after the censor, Appius Claudius, in B.C. 312. Its springs were between the sixth and seventh milestones from Rome, and its course was about 11 miles long. All but 300 feet was underground. The exact size of its channel is uncertain, but is given by several authors as about 2.5 feet wide and 5 feet high in the clear.

(2) *Anio Vetus*, constructed B.C. 272-270 by M. Curius Dentatus and Fulvius Flaccus. All but 1100 feet was underground. Remains may be traced both near Tivoli and near the Porta Maggiore. Its water is taken from the river Anio, about the twentieth milestone, three miles beyond Tivoli, and its course, which is very circuitous, is about 43 miles long. About 3.7 feet wide and eight feet high inside, of heavy masonry of peperino stone, plastered on the inside.

(3) *Aqua Marcia*, named after the prætor, Quintus Marcius Rex, B.C. 144-140, had its source in springs between Tivoli and Subiaco, near the thirty-sixth milestone from Rome, was over 62 miles long, carried into the city 195 feet above sea-level, so as to reach the top of the Capitol. Near its head it is 5.7 feet wide and 8.3 feet high, and further on it is 3 × 5.7 feet. This and the two preceding aqueducts were built of rough-hewn dimension stone, 18x18x42 inches, or more, while the later ones, except Claudia, were of concrete and brick. The greater part of Marcia was underground, but there were some long stretches on arches—over seven miles—some of which are still standing, and bear parts of two and three other aqueducts (Anio Vetus, Claudia, and Anio Novus) above them. This is especially the case near Tivoli, where there are superb viaducts and bridges alternating with tunnels. There are about six miles of arcades near Rome.

(4) *Aqua Tepula*, B.C. 125, leading from springs on the slopes of the Monti Albani, had at first an independent channel, on the arcades of the Marcia, 6 feet above it, or 201 feet above sea-level. It was 2.7 feet wide, by 3.3 feet high, and commenced not far from the eleventh milestone.

(5) *Aqua Julia*, the first imperial aqueduct, constructed by M. Agrippa, under Augustus, in 33 B.C., took water from springs near the source of Tepula (twelfth milestone), and was mixed with the latter to cool it, and entered Rome on the arcades of the Marcia, about 212 feet above sea-level. Its channel was 2.3 feet wide and 4.6 feet high. Portions of Marcia, Tepula, and Julia, one above the other, are still in existence at Porta Tiburtina.

(6) *Aqua Virgo*, B.C. 19, also constructed by Agrippa. Aqua Vergine, as it is now called, is still entire, having been restored by Popes Nicholas V. and Pius IV. The source of the

Aqua Virgo is near the eighth milestone, only 80 feet above sea-level; its channel was 14 miles long, and it entered the city 13 feet lower. The channel was about 1.6 feet wide and 6.6 feet high. It still supplies the famous Trevi fountain and others.

(7) *Aqua Alsietina*, about A.D. 10, constructed by Augustus, now called the Aqua Paola, starts at a pond near the fourteenth milestone, and supplies the fountains in front of St. Peter's and the Fontana Paola, on the Montorio. Its original object was for irrigating purposes, and to supply the Naumachia of Augustus, which was a sheet of water for the representation of sea fights. Its water, which was undrinkable, reached Rome in a channel 24 miles long, about 55 feet above the sea, the lowest level of any.

(8) *Aqua Claudia*, A.D. 38-52, commenced by Caligula and completed by Claudius, starts near the thirty-eighth milestone and is about 45 miles long. Its line of nearly ten miles of magnificent arches still stretches across the Campagna, and forms one of the grandest of Roman ruins. At its upper end its channel was 3.3 feet wide and 6.6 feet high. When it reaches the Campagna it carries the Anio Novus (see below), the lower aqueduct being of dimension stone and the upper of brick, lined with concrete. The water of these two aqueducts reached the Palatine 185 feet above the sea; but at Porta Maggiore the water in Anio Novus was at an elevation of 230 feet and Claudia 9 feet lower.

(9) *Anio Novus*, also A.D. 38-52, was nearly 62 miles long, thus being the longest of the aqueducts, and starting at the Anio, near the thirty-eighth milestone. Its channel had a width of 3.3 feet and a height of 9 feet. Some of its arches are over 100 feet high, and its ruins are as superb as those of the Claudia, the two combining before entering Rome.

Aqua Trajana, built in A.D. 109, started at Lake Bracciano, was about 40 miles long, followed nearly the same route as Aqua Alsietina and its waters join to form the supply of the present Aqua Paola. It was used for supplying the Janiculum and the Trastevere. In A.D. 226 an eleventh and last aqueduct was built, called *Aqua Alexandrina*, to supply the Campus Martius. The other aqueducts sometimes credited to old Rome were probably branches of some of the eleven.

Although stone continued in use for aqueducts under the Empire, concrete with *opus recticulatum* and concrete with brick were used both in various parts of Italy and even in Rome itself, especially in the Aqua Alexandrina and Nero's additions to the Claudia. There remain many imposing Roman aqueducts in different parts of the Empire. The high viaducts and bridges in France, such as those near Nîmes, Cahors, and Lyons; in Spain at Segovia, Mérida, and Tarragona; at Constantinople, at Beirut, at Cherchel and Carthage are especially imposing —higher and bolder than anything at Rome; some have two, some three superposed stories of arcades, with a total height of between 100 and 300 feet. The Pont du Gard and the aqueduct of Segovia are the finest in existence. The stonework in the provinces is even superior to the average in Rome. The following examples may be mentioned: *Italy:* Minturnæ (fine *opus reticulatum*, very decorative), Genoa (very early, c.210 B.C.), Puteoli, Pompeii, Termini in Sicily. *Gaul:* Nîmes (Pont du Gard), Lyons (4 aqueducts in *opus reticulatum*, with siphons and bridges), Metz (with a great bridge of 114 arches), Paris (3 aqueducts of late Roman date), Frejus (a superb example, built under Claudius, 30 miles long, with many arcades), Antibes (2 aqueducts, one still in use), Arles, Marseilles, Aix, Vienne, Autun, Besançon, Poitiers (4), Cahors (a superb three-storied viaduct), Toulouse, and many others. *Germany:* Mainz, Treves, Cologne, *Solicinium*, Windisch. *Spain:* Segovia (built under Trajan, 12 miles long, with a superb viaduct of 119 arcades, 818 yards long, in two stories), Tarragona (built in the Republican Period, c.210 B.C., 6 miles long, with magnificent two-storied viaduct of 11 and 25 arches), Chelva, Seville, Mérida (2 aqueducts, one still in use; the other by Augustus, with a viaduct of three stories), Consuegra, Calahorra. *Portugal:* Elvas, Evora, Beja. *Africa:* Tebessa, Constantine (3), Tipasa, Cherchel (Cæsarea), Orléansville, Carthage (Punic and Roman), Makter (with a viaduct). *Asia:* Anazarba, Beirut (with a bridge), Palmyra, Baalbek, Petra, Sinope, Nicomedia, Antioch, etc.

The Oriental provinces of the Empire, preserving Greek engineering traditions, were more scientific, as shown by frequent use of siphons. The Byzantine emperors continued the Roman traditions, as shown by the aqueducts of Valens and Justinian at Constantinople, in connection with which are the wonderful cistern-reservoirs in the city with their forests of columns. Adana, Mopsuestia, and many other Eastern cities were provided by Justinian with aqueducts. The Gothic kings attempted the same, as in the extremely bold viaduct at Spoleto, loftier than any Roman work; their work in Spain was continued by the Moors, as at Elvas. The Mohammedans throughout the East continued the construction of aqueducts; but the Middle Ages in Europe were comparatively inactive in this branch of engineering. The Gothic aqueduct at Solmona and that at Coutances are perhaps the finest in Europe of this age. The Renaissance renewed the art, beginning with the Roman popes of the Sixteenth Century. France soon followed suit, as in the aqueduct of Arceuil at Paris built for Marie de Medici in 1613, and that of Maintenon under Louis XIV. In 1753 Charles III. built the great aqueduct of Caserta, about 30 miles long. The aqueduct of Marseilles, begun in 1847 and over 40 miles long, with 75 tunnels and several viaducts, is the only work of modern engineering construction comparable artistically to the Roman; it could have been built for a fraction of the cost ($1,200,000) by using siphons.

Among the European aqueducts constructed during the latter part of the Nineteenth Century may be mentioned, first, that conveying water from Loch Katrine to Glasgow, built in 1855-60 and duplicated quite recently. The new water-supply conduits of Manchester and Liverpool, built in 1881-92 and 1885-94, respectively, are partly masonry structures and partly pipe lines. The Liverpool supply is brought from Lake Vyrnwy, a distance of 68 miles, partly in tunnel. The Manchester supply comes from Lake Thirlmere, a distance of nearly 96 miles, through 36 miles of concrete conduit and 14½ miles of tunnel, making 50½ miles of masonry aqueduct, and through 45 miles of iron pipe. The largest tunnel is 8½ miles in length, and the longest inverted siphon, of iron pipe, is about the same length. Another inverted siphon is under a head of 480 feet. The masonry aqueduct is 7 feet in diameter. In the United States notable aqueducts were completed by New York in 1842 and a second in 1890 (old and new Croton); Boston in 1848 and a second in 1878; Brooklyn in 1859; Baltimore in 1862 and a second in 1880; Washington in 1863, with a second one begun in 1883, abandoned before fully completed and finally put in use in January, 1902; St. Louis, Mo., about 1893; the Metropolitan Water Board (Boston and surrounding towns) in 1897; Jersey City, put in use in 1904, but on this work masonry aqueducts and tunnels are used only where steel pipe lines are not available. Cast-iron, steel, or wood pipe is used in place of masonry aqueducts for nearly all American water-works, especially in recent years, and with the introduction of riveted steel pipes; and where masonry is used the trend of the latest practice is to employ concrete, either alone or reinforced by steel rods, wire, or expanded metal. The steel is embedded in the concrete, and since it can resist high tensile strains, aqueducts of reinforced concrete may be subjected to pressure. Reinforced concrete was employed on the Jersey City aqueduct.

The *Old Croton Aqueduct*, supplying New York City, has a total length of 38.1 miles and a total fall of 43.7 feet, the ordinary grade being 1.1088 feet per mile. It is of brick-lined masonry, the bottom being an inverted arch of 6.75 feet chord, 0.75 feet versed sine; sides, 4 feet high, battered to 7.42 feet apart at top; covered with semi-circular arch, giving total interior height of 8.64 feet and cross-sectional area of 53.34 square feet. The Harlem River is crossed on a granite masonry arched bridge, 100 feet high in the clear, and about 1400 feet long, the water being conveyed in two 36-inch cast-iron and one 90½-inch wrought-iron pipe, the latter added in 1860. The Manhattan Valley is crossed by inverted cast-iron pipe siphons, two miles long, the original two 36-inch pipes being supplemented by a 48-inch in 1853 and a 60-inch in 1861, the latter being reported as the largest iron pipe cast up to that time. The aqueduct was designed to carry 72,000,000 gallons a day. In 1865, the portion of aqueduct below Ninety-second Street was replaced by two 72-inch cast-iron pipes, for which three 48-inch pipes were substituted later on. In 1870 another length of aqueduct within the city was replaced by six parallel lines of 48-inch cast-iron pipe, ¾ mile long. This aqueduct was carried as near the surface as the grades would permit. The *New Croton Aqueduct*, like the old one, begins at Croton Lake, formed by a dam on the Croton River, and extends to 135th Street, New York City. Its total length is 30.87 miles, or 33.25 miles if the pipe line extension to the Central Park reservoir is included. Of the masonry aqueduct, 29.63 miles is in tunnel, requiring shafts from 18 to 402 feet deep for its construction. In general the aqueduct is shaped like a horseshoe, 13.53 feet high and 13.6 feet wide, has a fall of 0.7 foot per mile and an original rated carrying capacity (see below) of about 318,000,000 gallons a day. At the Jerome Park storage reservoir, in the north part of the city, and some 23 miles from the upper end, it is reduced to a rated capacity of 250,000,000 gallons a day and changed to a circular section, 12¼ feet in diameter, for over 6 miles. It crosses beneath the Harlem River, still as a masonry aqueduct, under 55 pounds pressure, when full, the aqueduct here being 10½ feet in diameter, lined with cast iron. The cost of the aqueduct varied from $89.98 to $123.25 per lineal foot in different sections and under varying conditions. When the new aqueduct was designed it was estimated that it would carry 318,000,000 gallons a day, when flowing to a depth of 12.842 feet in the horseshoe sections. Gaugings after its completion fixed the carrying capacity at about 302,500,000 gallons. Careful studies made by Mr. John R. Freeman in 1899 (*Report Upon New York's Water Supply*, New York, 1900) led him to conclude that the aqueduct was then carrying 16 per cent. less for stated depths than shown by the earlier gaugings, part of the difference being due to deterioration of the inner surface.

The *Wachusett Aqueduct* for Boston and vicinity has a rated daily capacity of 300,000,000 gallons. It is 12 miles long, if the 3 miles of canal at its lower end are included, and leads from the site of a handsome masonry dam on the Nashua River, at Clinton, Mass., to the Sudbury reservoir, a part of the old Boston waterworks now controlled by the Metropolitan Water Board. The first two miles of the Wachusett aqueduct is in tunnel, through rock so compact that about one-half of it required no lining. After the tunnel come 7 miles of aqueduct proper, built in embankment or in excavation. Both tunnel and covered aqueduct were built in the general shape of a horseshoe, from 11½ to 13½ feet wide and from 10½ to 11 feet 10 inches high, and were of concrete, with the lower portion lined with one course of brick. Below the section just described there are 3 miles of open channel or canal. The aqueduct is carried over the Assabet River on a handsome granite masonry bridge of seven 29½-feet spans.

The *Cabin John Arch*, which carries the first Washington aqueduct across a creek of the same name, was for many years the largest single-span masonry bridge in the world, having a length of 220 feet, and rising to a height of 101 feet in the clear. The rise of the arch, from the spring line, is 57½ feet. The bridge is 20 feet wide and its total length is 420 feet. It was built of large granite blocks, with sandstone parapets and coping. It cost $237,000.

In 1906 the City of Mexico was building a reinforced concrete aqueduct of 73,000,000 gallons capacity a day, and of a length of about 17 miles and of a cross-section equivalent to a diameter of about 6.5 feet.

Consult: Frontinus, *De Aquæductis* (edited by Herschel, New York, 1900); Friedländer, *Darstellungen aus der Sittengeschichte Roms* (Leipzig, 1888-90); and Leger, *Les travaux publics des Romains* (Paris, 1875).

A′QUEOUS HU′MOR. The fluid which occupies the space in the eye between the back of the cornea and the front of the lens, which in fœtal life is divided into an *anterior* and a *posterior* chamber by the membrana pupillaris (q.v.), and in adult life by the iris. It consists of water, with, according to Berzelius, about a fiftieth of its weight made up of chloride of sodium and extractive matters held in solution. This watery secretion is produced by epithelial cells covering the posterior surface of the iris and the ciliary muscle. (See Eye.) It is rapidly resecreted if allowed to escape by any wound in the cornea.

AQUEOUS ROCKS. In geology, rocks which have been laid down as mechanical, chemical, or organic deposits from water. They belong to the *sedimentary rocks*, which also include rocks deposited from air (æolian deposits).

I. The mechanical deposits from water are derived from the destruction of preëxisting rocks. Rain and rivers move considerable quantities of disintegrated material, depositing it wherever the load is too great for the volume and velocity of the current. Waves, rolling against a shore, break from it small and large fragments, carry these fragments back with them, and deposit them in layers on the bottom of the basin. The coarse particles are left nearest the shore, forming conglomerate or gravel; finer particles are carried somewhat farther out, forming sand, which by cementation becomes sandstone, quartzite, novaculite, or, when mixed with feldspar, arkose or graywacke; still finer particles are carried yet farther out and are deposited, to form mud or clay, which by cementation or consolidation becomes mudstone, shale, or slate.

II. Chemical deposition from water may be due to the mingling of solutions, to changes in the temperature or pressure of water containing substances in solution, or to the simple evaporation of water. For convenience in discussion, chemical precipitates may be divided into three general classes: (a) precipitates of the alkalies and alkaline earths, giving calcareous tufa, sinter, travertine, stalactite, onyx marbles, oölite, gypsum, rock salt; (b) siliceous precipitates, giving chert (flint or hornstone), geyserite, siliceous sinter; (c) ferruginous precipitates, giving iron ores. These latter are largely deposited through the aid of decaying vegetable matter, and might properly be considered under class III., but the deposition is due rather to the chemical effect of dead organisms than to the activities of the living forms.

III. Organic deposits originate in the growth and decay of organisms, either *in situ* or after transportation. Deposits of this character are commonly made in water which is deeper and quieter than that in which chemical deposits are made. They may be divided into—(a) calcareous accumulations, resulting in shell marl, chalk, limestone, dolomite; (b) siliceous accumulations, such as infusorial earth, siliceous ooze, some forms of flint or chert; (c) ferruginous accumulations, resulting in certain bog ores; (d) carbonaceous accumulations, known as peat, lignite, brown coal, or coal.

Rocks of mechanical and organic deposition form the great mass of the aqueous rocks. The common order of occurrence from the shore outward—conglomerate, sandstone, mud, and limestone—corresponds in a general way with increase in depth of water. It follows, therefore, that if at any point the body of water is transgressing on the land, resulting in deepening of the water, the *vertical* order of superposition of mechanical deposits will be conglomerate, sandstone, shale, and limestone; and, vice versa, if the water is receding, the order will be reversed. There is thus a change of character of the sediments in any series both laterally and vertically. The aqueous rocks of the earth's crust are found in such recurring successions and by their study the vertical oscillations of continents and ocean have been determined. In a very general way, it may be said that the succession of aqueous deposits during geological history has been much the same the world over. The members of this succession have been grouped into divisions on the basis of their order of superposition, their structure, and their contained fossils, and these divisions correspond to the time divisions of geological history. See Geology; Limestone; Lithogenesis.

AQUILA, ä'kwê-lȧ, Degli Abruzzi (It., Aquila of the Abruzzi). An episcopal city in south Italy, on the Terni-Solmona Railway, 62 miles southeast of Terni (Map: Italy, H 5). It is pleasantly situated on a hill beside the Averno; the streets are broad, the houses picturesque, the churches numerous and interesting. It is a favorite summer resort for Italians. As the meeting-point of roads leading to Apennine passes that have been compared to Thermopylæ, it is of great strategic importance. Aquila was built about 1240 by the Emperor Frederick II. from the ruins of Amiternum, the birthplace of Sallust, the Roman historian. In 1703 it was almost destroyed by an earthquake, in which two thousand persons perished. It has linen, leather, paper, and wool factories, and is an important saffron market. Population, in 1881, 14,720; in 1901, 21,188.

AQ'UILA, Greek Version of. See Aquila, Ponticus.

AQUILA, ä'kwê-lȧ, Johann Kasper (1488-1560). A German Protestant reformer. He was born in Augsburg, studied at Ulm and in Italy, and in 1515 was appointed chaplain to Franz von Sickingen. He accepted Lutheranism and was imprisoned, but was released, and while court chaplain to the Elector of Saxony at Wittenberg (1524-27), through his knowledge of Hebrew assisted Luther in translating the Bible. Against the Interim (q.v.) he wrote *Christliche Bedenken auf das Interim* (1548), and *Das Interim illuminiert* (1548), for which a price was set on his head by Charles V. In 1552 he was restored to his pastorate at Saalfeld, which Luther had procured for him in 1527, and filled that office until his death.

AQ'UILA, Ponticus, i.e., Aquila of Pontus (Lat. *Aquila Ponticus*). A celebrated translator of the Old Testament into Greek, who flourished about A.D. 130. He lived in Palestine and seems to have been a pagan converted first to Christianity and subsequently to Judaism. He studied under the Jewish Rabbis, notably the celebrated Rabbi Akiba. His Greek version, fragments of which are preserved in Origen's *Hexapla*, was marked by an extreme literalness of translation; it was probably this literalness that made the Jews for a long time prefer the version of Aquila to the Septuagint translation. A recently found specimen of Aquila's translation has been published by F. C. Burkitt, *Fragments of the Book of Kings, according to the translation of Aquila* (Cambridge, 1897).

AQ'UILA'RIA. See Aloes Wood.

AQ'UILE'GIA. See Ranunculaceæ.

AQUILEJA, ä'kwê-lä'yȧ (or Aglar, ä-glär', as it was called in the Middle Ages). A small town of the Austrian crown-land of Görz and

Gradisca, situated on the Lagunadi Grado, which connects it with the Adriatic, about twenty-five miles west-northwest of Trieste (Map: Austria, C 4). This once flourishing seaport has dwindled to an insignificant fishing-place of less than a thousand inhabitants, with little to remind one of its former prosperity and importance but its ancient cathedral and the remains of the Patriarch's Palace. It offers, however, a rich field to antiquarians. Colonized by the Romans in B.C. 182, it became in time the second city of Italy, and in A.D. 168 was so strongly fortified by Marcus Aurelius as to be considered the first bulwark of the Empire on the north. In the reign of Hadrian, its population was between 300,000 and 500,000. It was the meeting-place of the Æmilian Way and the roads leading to central and southeastern Europe, and one of the principal naval ports. Here the Emperor Maximinus perished (238), and in the vicinity Constantine II. lost his life in a battle against his brother Constans (340). When the town was destroyed by Attila (452), it had 100,000 inhabitants. It never recovered, although between 556 and 1750 it was the seat of a patriarchate. In 1809 it was acquired by Austria.

Consult: Bartoli, *Le Antichita d'Aquileja* (Venice, 1739); Zahn, *Austria Friulana* (Vienna, 1877); Meyer, *Die Spaltung des Patriarchats Aquileja* (Berlin, 1898).

AQUI'NAS, THOMAS, *or* THOMAS OF AQUINO (c.1226-1274). One of the most influential of the scholastic theologians, who bears the honorable titles and epithets of *Doctor Communis* ("Universal Doctor," Fourteenth Century); *Doctor Angelicus* ("Angelical Doctor," Sixteenth Century); *Princeps Scholasticorum* ("Prince of Scholastics"); *Doctor Ecclesiæ* ("Doctor of the Church," 1567); "Patron of all Catholic Schools" (1880). He was of the family of the counts of Aquino, in the Kingdom of Naples, and was born in the castle of Rocco Secca, directly north of Aquino, about fifty miles northwest of Naples, about 1226. He received the rudiments of his education from the Benedictine monks at Monte Cassino, which was only a few miles away, and completed his studies at the University of Naples. A strong inclination to philosophical speculation and theological study determined the young nobleman, against the will of his family, to enter (1243) the Order of Dominicans. In order to frustrate the attempts of his friends, especially his mother, to force him to give up his monastic life and enter the world, his order sent him to Rome, and thence to Paris. On his way thither his brothers overtook him at Acquapendente, and by force brought him to the castle of Saint John, near Aquino, and there he was closely guarded for a year, and every effort was made to break his resolution to remain a monk. But at length his mother came to his release, and he went, in the company of the General of the Dominicans, to Paris and thence to Cologne, about 1245, where he studied under Albert the Great (Albertus Magnus). At Cologne he pursued his studies in such silence that his companions gave him the name of the "Dumb Ox." But Albert, his master, is reported to have predicted, "that this ox would one day fill the world with his bellowing." He accompanied him to Paris in 1245 and back to Cologne in 1248, when Albert was commissioned by his Order, the Dominican, to establish a theological school there. In it Aquinas taught himself until in 1251 (or 1252) he was sent to Paris to teach in the Dominican monastery of Saint Jacques. He had taken the usual degrees, but the highest, the doctorate, was not conferred upon him till 1257, by the University of Paris, because of the fight between it and the Mendicant Orders. He defended his Order in his *Contra Impugnantes Dei Cultum et Religionem.* He was already a distinguished scholar and teacher. He continued to lecture with great applause in Paris, till Urban IV., in 1261, called him to Italy to teach philosophy in Rome, Bologna, Pisa, and other places. Finally he came to reside in the convent at Naples (1272-74), where he declined the offer of the dignity of archbishop, in order to devote himself entirely to study and lecturing. It was while there that the following incident is said to have occurred. One day Christ appeared to him and said: "You have written ably about me. What reward would you like to have?" He said: "Lord, nothing, except thyself." Being summoned by Gregory X. to attend the general council at Lyons, he was taken ill on the way in the castle of his niece at Ceccano. Realizing that it was his last illness, he was at his own request transferred to the neighboring Cistercian monastery of Fossanuova, so that he might die in a religious house. He lingered there a month and died on March 7, 1274. According to a report, he was poisoned at the instigation of Charles I. of Sicily, who dreaded the evidence that Aquinas would give of him at Lyons. Dante held this opinion (*Purgatory,* xx. 68), but it is probably not true. His relics were fought for, and his right arm is now in Saint Jacques, Paris, other parts in Salerno and Naples, and the rest of his body in Rome. He was canonized July 18, 1323.

Even during his life Aquinas enjoyed the highest consideration in the Church. His voice carried decisive weight with it. A general chapter of Dominicans in Paris made it obligatory on the members of the Order, under pain of punishment, to defend his doctrines. Like most of the other scholastic theologians, he had no knowledge of Greek or Hebrew, and was almost equally ignorant of history; but his writings display a great expenditure of diligence and dialectic art, set off with the irresistible eloquence of zeal. His chief works are: *A Commentary on the Four Books of Sentences of Peter Lombard,* the *Summa Theologiæ, Quæstiones Disputatæ et Quodlibetales,* and *Opuscula Theologica.* He gave a new and systematic foundation to the doctrine of the Church's treasury of works of supererogation, to that of withholding the cup from the laity in the communion, and to that of transubstantiation. He also treated Christian morals according to an arrangement of his own, and with a comprehensiveness that procured him the title of the "Father of Moral Philosophy." The definiteness, clearness, and completeness of his method of handling the theology of the Church, gave his works a superiority over the text-books of the earlier writers on systematic theology. His *Summa Theologiæ* is the first attempt at a complete theological system, but he died ere he could complete it. In his philosophical writings, the ablest of which is his *Summa de Veritate Catholicæ Fidei contra Gentiles,* he throws new light upon the most abstract truths. The circumstance of Aquinas being a Dominican, and boasted of by his Order as their great ornament, excited the jealousy of the Franciscans against him. In the beginning of the Fourteenth Century, Duns Scotus (q.v.), a Franciscan, came forward as the declared opponent of the doctrines of Aquinas, and founded the philosophico-theological school of the Scotists, to whom the *Thomists*, mostly Dominicans, stood opposed. The Thomists leaned in philosophy to nominalism (q.v.), although they held the abstract form to be the essence of things; they followed the doctrines of Augustine as to grace, and disputed the doctrine of the immaculate conception of the Virgin. The Scotists, again, inclined to realism and to the views of the Semipelagians, and upheld the immaculate conception.

Pope Leo XIII. in his Encyclical, "Æterni patris" (August 4, 1879), declared that the philosophy and theology of Aquinas was the proper basis for all such teaching in Catholic Christendom. His life was spent in such great toil, not only as an author but as a teacher and as the trusted servant of his order and the adviser of popes, that it was comparatively brief. Yet its literary product was enormous. His mind was remarkably clear, so that although he was the very embodiment of the scholastic method of endless analysis and questionings, he wrote in a way intelligible and interesting to the modern reader. One of his great services is the prominence he gives to Aristotle, upon whose works he wrote elaborate commentaries. Plato also was his master, and to the fathers he yielded loyal submission. He also was a profound Bible student, as he showed in his *Catena Aurea*, which is an exhaustive theological interpretation of the Gospels. In fact, take him all in all, there is no theologian of the past who deserves and rewards study more than he, and the Roman Church does well in accepting him as her great master in theology.

His works, all written in Latin, were first printed by Pope Pius V. (Rome, 1570-71, 17 vols., folio; mod. ed., Paris, 1871-80, 34 vols., 8vo.; probably final form, sanctioned by Pope Leo XIII., Rome, 1882). The greatest of the works, the *Summa Theologiæ*, was reprinted in eight volumes (Paris, 1869); German translation, 12 volumes (Ratisbon, 1886-92). The *Summa de Veritate Catholicæ Fidei* has been published in French, with Latin text (Paris, 1854). Modern English translations of parts of all the works have been published as follows: *Catena Aurea* (8 volumes, London, 1841-45); *On the Rulers and Members of Christian States*, from *De Regimine Principum* (London, 1860); *Homilies upon the Epistles and Gospels for the Sundays of the Christian Year*, and the *Festival Homilies* (London, 1873); *On the Two Commandments of Charity and the Ten Commandments of the Law* (London, 1880); *Notes on the Angels* (London, 1888); *Maxims and Prayers and the Little Office* (London, 1890); *On the Sacrament* (London, 1890); *Aquinas Ethicus, or the Moral Teachings of Saint Thomas* (London, 1892); *The Lord's Prayer*, made up of parts of the *Summa*, in condensed translation (London, 1892). For interpretation of his work in general, consult: L. Schütz, *Lexicon. Sammlung, Uebersetzung und Erklärung der in sämmtlichen Werken des heiligen Thomas von Aquinas vorkommenden Kunstausdrücke und wissenschaftlichen Aussprüche* (Paderborn, 1895). For his biography, consult: In English, R. B. Vaughan (London, 1893), Pius Cavanagh (1890); in German, C. Werner (Regensburg, 1858-59), J. Tansen (Kevelaer, 1898); in Dutch, H. J. Schaepman (Utrecht, 1898).

AQ'UITA'NIA. The Latin name of a part of Gaul, originally including the country between the Pyrenees and the Garonne, peopled by Iberian tribes. Augustus, when he divided Gaul into four provinces, added to Aquitania the country lying between the rivers Garonne and Loire. Shortly before the extinction of the Roman Empire, Aquitania passed into the hands of the West Goths. In 507 it was conquered by Clovis, King of the Franks, and during the Merovingian dynasty became an independent duchy. Though subjugated by Charlemagne, the Duchy again claimed independence under the weak monarchs of the Carlovingian dynasty. In 1137 Aquitania (or Aquitaine, a name later supplanted by the name *Guienne*) was united to the crown of France by the marriage of Louis VII. with Eleanor, heiress of Aquitania. In 1154 it was united with England, as the result of the marriage (1152) of Henry Plantagenet with Eleanor, whom Louis had divorced, and a long series of disputes took place between England and France respecting Aquitania, which was ultimately united to the crown of France by Charles VII. in 1451.

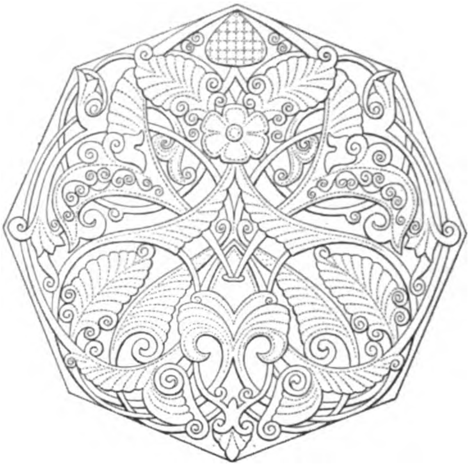
ARA, ä'rȧ, or Araba (local native name). The great black cockatoo (*Microglossa aterrima*) of the Malayan Islands and the north coast of Australia. It is the largest known parrot, reaching a length of about thirty inches, and when fully adult is wholly black, except the bare, bright-red cheeks. Its beak is of extraordinary thickness and power, enabling it to live largely on the stone-hard, oily fruit of the kanari tree (*Canarium commune*); it also eats palm "cabbage," and hence has been called the great palm cockatoo. It lives in the forest, in pairs rather than in flocks, is shy, and utters a low, double whistle. It is rarely kept in captivity. See Cockatoo, and plate of Cockatoos and Macaws.

ARABAH, ä'rȧ-bȧ. The valley of the Dead Sea, as far as the Gulf of Akabah (Heb.—Deut. i. 1). This name is also applied to the valley of the Lake of Galilee (Deut. iii. 17), and many therefore originally have been used to designate the entire length of the depression. At present El-Arabah is confined to the southern part, while the Jordan Valley is called El Ghor. See El-Aabah.

AR'ABA'TA (native South American name). The straw-colored howler. See Howler.

ARABESQUE, ăr'ȧ-bĕsk' (Fr.). A term which means merely *after the Arabian manner;* and, so far as etymology is concerned, might therefore be general in its application. In practice, however, it is used to characterize any kind of carved or painted decoration, especially in conjunction with architecture, which is not in close imitation of natural forms, either animal or vegetable, but admits of schematic, heraldic, and fantastic devices. It was originally used of the purely geometric ornamentation of Mohammedan architecture, but is equally applicable to the decorative work of the Alexandrian Greeks, and especially that of the

Romans (Pompeii, Rome, etc.), which was taken as a model at the Renaissance, and has never been surpassed in variety and delicacy. The arabesque of the Mohammedans differed from other forms in entirely excluding the figures of animals and men, the representation of which was forbidden by the Mohammedan religion, and confining itself to purely geometric shapes and to the foliage, flowers, fruit, and tendrils of plants and trees, curiously and elaborately intertwined. This limitation of the field of arabesque was not observed in Christian art. The Byzantine schools and the Northern barbarians — Celts, Goths, Saxons, Lombards — used the schematic heraldic forms of this style. So did, to a lesser degree, the Romanesque artists. The Gothic style returned to the study of natural forms almost entirely, but the Renaissance, notwithstanding its naturalism, was very partial to the arabesque, imitating in the Fifteenth Century the antique carved friezes and pilasters, and in the Sixteenth Century the painted designs discovered on the walls of the Baths of Titus, the Golden House of Nero, and the imperial palaces on the Palatine. Raphael's arabesques in the Vatican are the most famous and beautiful of these imitations. Further impetus to this type of design was given in the last century by the discoveries at Pompeii and Herculaneum.



MOHAMMEDAN ROSEWORK

ARABGIR, ä′răb-gēr′. See Arabkir.

ARA′BIA. The great southwestern peninsula of Asia, called by the inhabitants "Jazîrat-al-'Arab," the peninsula of Arabia; by the Turks and Persians, "Arabistan." It is situated in latitude 12° 40′ to 34° N., and longitude 32° 30′ to 60° E. Its length from north to south is about 1500 miles, and its greatest breadth about 1200; its area is about 1,200,000 square miles (Map: Turkey in Asia, D 6). It is bounded on the north by Asiatic Turkey; on the east by the Persian Gulf and the Gulf of Oman; on the south by the Indian Ocean and the Gulf of Aden, and on the west by the Red Sea. It is connected with Africa on the northwest by the Isthmus of Suez. Through the centre of the land, between Mecca and Medina, runs the Tropic of Cancer. The name Arabia has been derived by some from *'Araba* (which means a level waste), a district in the territory of Tihamah; by others, from *'Eber,* a word signifying a nomad ("wanderer"), as the primitive Arabs were such. This would connect it with the word Hebrew, which has a similar origin. Others again are inclined to derive it from the Hebrew verb *'Arab,* to go down—that is, the region in which the sun appeared to set to the Semitic dwellers on the Euphrates. There is also a Hebrew word, *'Arabah,* which means "a barren place," and which is occasionally employed in Scripture to denote the border land between Syria and Arabia. Ptolemy is supposed to be the author of the famous threefold division into *Arabia Petræa, Arabia Felix,* and *Arabia Deserta,* which has been generally used since his time; the first included the northwest corner; the second, the west and southwest coasts; and the third, the dimly known interior. This division, however, is not recognized by the natives themselves; neither is it very accurate as at present understood, for *Petræa* was not intended to mean rocky or stony. Ptolemy formed the adjective from the flourishing city of Petra (the capital of the kingdom of the Nabatæans), whose proper name was Thamud—that is, the rock with a single stream. The word *Felix,* also, arose from an incorrect translation of Yemen, which does not signify "happy," but the land lying to the *right* of Mecca—as Al-Sham (Syria) means the land lying to the left of the same. The divisions of the Arab geographers are as follows: (1) *Bahr-el-Tur Sinai* (Desert of Mount Sinai); (2) *Hijâz* (a barrier), along the Red Sea; (3) *Tihâmah* and *Yemen,* along the Red Sea; (4) *Hadramaut,* the region along the southern coast; (5) *Oman,* the sultanate of Muscat, in the extreme east; (6) *Bahrain,* on the Persian Gulf; (7) *El-Hasa,* along the Persian Gulf; (8) *Nejd,* the central highlands of Arabia.

Our knowledge of the interior of Arabia is still very imperfect in detail, but its general characteristics are decidedly African. The largest portion of it lies in that great desert zone which stretches from the shores of the Atlantic to those of the Northern Pacific. The interior, so far as it has yet been explored by Europeans, seems to be a great plateau, in some places reaching a height of 8000 feet. The western border crest of this plateau may be regarded as part of a mountain-chain, beginning in the north with Lebanon, and stretching south to the Strait of Bab-el-Mandeb. From Bab-el-Mandeb another chain runs northeast, parallel to the coast, to Oman. The elevation of the mountains in the extreme south of the peninsula is estimated at 13,000 feet. From the mountain-range on the west the plateau slopes to the northeast, and forms in general a vast tract of shifting sands, interspersed here and there about the centre with various ranges of hills, which, like the shores of the peninsula, are generally barren and uninteresting.

One of the chief characteristics in the physical aspect of the country is the scarcity of permanent rivers. With the exception of Maidan, at the southwestern end of the country, the streams of Arabia dry up for a considerable part of the year. Like most desert regions, Arabia has a large number of dried-up river courses, or *wadies,* among which the Wadi al-Rumen is the longest, traversing under different names the entire country from west to east.

Springs are very few, and in the cultivated parts of the country large numbers of wells, cisterns, and reservoirs are prepared for the reception of rain water.

Arabia has, on the whole, an African climate. Though surrounded on three sides by the sea, its chains of hills exclude in a great measure the modifying influence of air currents from the ocean. In several parts of Arabia hardly a refreshing shower falls in the course of the year, and vegetation is almost unknown; in other torrid districts the date-palm is almost the only sign of vegetable life. Over vast sterile tracts hangs a sky of almost eternal serenity. The time and duration of the rainy season varies in the different parts of the country. In Yemen it lasts from June to September, and is often followed by a shorter rainy season in the spring. In the coast regions of Hadramaut and Oman it lasts from February to April, while in the highlands of the former it takes place between April and September. Light frosts mark the winters in the centre and northeast. During the hot season the simoom (q.v.) blows, but only in the northern part of the land. The districts which are not too arid for culture produce wheat, barley, millet, dates, tobacco, indigo, cotton, sugar, tamarinds, coffee, balsam, aloe, myrrh, frankincense, etc. Arabia has but a small area of forests, but has vast stretches of desert grass, fragrant with aromatic herbs, and furnishing admirable pasturage for the splendid breed of horses. Coffee, one of the most important exports, is an indigenous product both of Arabia and Africa, as are also the date-palm and banana. The trade in coffee, dates, figs, spices, and drugs, though still considerable, is said to be only a shadow of the old commerce which existed before the circumnavigation of Africa, or when Aden was in its prime and the Red Sea was the great commercial route to the East. Arabia has few manufactures, but carries on a transit trade in foreign fabrics, besides importing these to some extent for its own necessities.

In the animal kingdom, an African character prevails generally. Sheep, goats, and oxen satisfy the immediate domestic and personal necessities of the inhabitants, to whom the camel and horse are trusty companions in their far wanderings. Gazelles and ostriches frequent the oases of the deserts, where the lion, panther, hyena, and jackal hunt their prey. Monkeys, pheasants, and doves are found in the fertile districts, where flights of locusts often make sad devastation. Fish and turtle abound on the coast. The noble breed of Arabian horses has been cultivated for several thousand years; but the most characteristic of all animals in the peninsula is the camel (q.v.) which has been both poetically and justly styled "the ship of the desert." The breed of Oman is celebrated for its beauty and swiftness. Among the minerals of Arabia may be mentioned iron, copper, lead, coal, basalt, and asphaltum, and the precious stones emerald, carnelian, agate, and onyx. Pearls are found in the Persian Gulf.

The population of Arabia is estimated at between 3,500,000 and 5,000,000, including about half a million Bedouins. The Arab is of medium stature, compactly built, and of brown complexion. Earnestness and pride are distinctive characteristics; by nature he is quick, sharp-witted, lively, and passionately fond of poetry. Courage, temperance, hospitality, and good faith are his leading virtues; but these are often marred by a spirit of sanguinary revenge and rapacity. His wife keeps the house and educates the children. Education is widespread and illiteracy is unknown; even in the desert the children are taught to read, write, and calculate. The Arab cannot conceive a higher felicity than the birth of a camel or a foal, or that his verses should be honored with the applause of his tribe. The Arabs are generally monogamists, although frequently the wealthy chiefs have several wives. Matrimonial ties are severed at will, and the ill-treated wife can always find refuge in her father's tent. The Arabs are all Mohammedans.

Arabian life is either *nomadic* or *settled.* The wandering tribes, or Bedouins, are well known to entertain very loose notions of the rights of property. The located tribes, styled Hadesi and Fellahs, are despised by the Bedouin, who scorns to be tied down to the soil, even where such bondage might make him wealthy.

The prehistoric home of the Arabians was in the southern interior of the peninsula named after them, though some ethnologists are inclined to assign them an original home with other Semites in Africa. In their own persons, or by their language, culture, and religion, they have made their influence felt over a great part of Africa, southern Europe, southern and central Asia, and the Indian Archipelago. They have contributed to the knowledge of the world the pseudo-science of alchemy, a certain number of terms used in the mathematical and physical sciences, and the Arabic numerals, really borrowed from the Hindu. The Arabic alphabet is found among peoples as widely distant as the Vei of West Africa and the Bugis of Celebes. The Arabs fostered commerce and geographical exploration in the Middle Ages, created a new order of architecture, made the productions of the ancient Greek intellect accessible to European nations, and in the cultivation of the sciences, philosophy, literature, and art were long in advance of the rest of the world. According to Brinton, the Arab "preserves in his language the oldest and purest form of Semitic speech, and in mind and body its most pronounced mental and physical type"; but the purity of the Arab type has been exaggerated, for, like the Jew, he presents examples of the tall and the short type, the long-headed and the broad-headed, the brunette and the blond, the straight-haired and the wavy-haired, evidencing considerable intermixture with Negroid and Aryan elements. As a special branch of the Semitic stock, the Arabians include the Bedouins of northern and central Arabia, as well as those who have wandered into Egypt, other parts of northern Africa, Palestine, and Mesopotamia; the tribes dwelling in Hadramaut, Yemen, Hejaz, Oman, and on the shores of the Persian Gulf; the various Arab, rather than Bedouin, communities of Asia Minor and other countries to the east. In the Arabian group belong, also, the ancient Himyarites, or Sabæans (the people of the famous Queen of Sheba), who have left behind them in the southwest of the peninsula many inscriptions and other relics of an important culture destroyed by their ruder successors. By language many of the peoples of Abyssinia, and some outside its borders, are Arabians, their speech being more or less related to the old Himyaritic. Such are the tribes speaking Tigré, Tigriña, and Amharic. These Ethiopian Semites—or, rather, Semitized Ethiopians—are the result of a secondary migration from Arabia into Africa. A great part of the "Arabs" of northern Africa and central and eastern Asia are merely Hamites, Negroes, Aryans, Mongolians, and Malays who have received a large infusion of Arab blood. Keane (1896) is right in emphasizing the absorptive power of the Arabs, to whom the mass of the other Semites in Asiatic Turkey are becoming more and more assimilated. See plate, RACES OF ASIA, accompanying ASIA.

Politically, Arabia is divided as follows: The Sinai Peninsula forms a dependency of Egypt. The western coast, forming the two provinces of Hejaz and Yemen, as well as the region of al-Hasa, on the eastern coast, belong to Turkey. Oman is administered by an independent imam, while Aden (q.v.) forms a dependency of Great Britain, which exercises a protectorate over a considerable territory. The remainder of the country is divided into a number of independent or semi-independent states, under hereditary or chosen chiefs, bearing the title of emir, sheik, or imam. Their function appears to be limited to leading the troops in time of war, to levying tribute, and to the administration of justice. A spirit of liberty in the people moderates the authority of their chieftains; but instances of extreme despotism have not been unfrequent, both in early and modern times. The most important cities of Arabia are Mecca, Muscat, Jiddah, Hodeida, Medina, Riad, Aden, and Mocha.

HISTORY. Of the first settlement of Arabia nothing is known. From time immemorial the Arabian Peninsula has been the home of Semitic tribes; and the tendency of modern scholarship is to regard Arabia as the original home of the Semites. Arabic writers follow in this respect the popular distinction between the northern and southern tribes, and trace each back to fictitious ancestors—the former to Ishmael, the son of Abraham; the latter to Kahtan, a mythical hero; but, naturally, all such notices have no historical value whatsoever. The distinction, however, between the northern and southern inhabitants is justified, and applies to Arabic history until the union of all the tribes under the influence of Islam. Culture proper began in the south, and by the help of numerous inscriptions, found especially by Glaser, it is possible now to trace back Arabian history to about B.C. 1500, at which time we find a flourishing nation in the south, known as the Himyarites. The stronghold of the Himyaritic power was in the kingdom of Yemen, in the southwestern corner of the peninsula, where also the earliest traces of Arabic civilization may be found. Less important principalities existed all over the southern part of the peninsula, extending across its entire breadth, from the Red Sea to the Persian Gulf. The Himyaritic kingdom was succeeded by the Sabæan, which lasted well into the Christian era. As contrasted with the nomad tribes of central and northern Arabia, the inhabitants of Yemen were a highly advanced race, dwelling in cities, actively engaged in commerce, and possessing well-defined political institutions. The tribes of the north were never recognized by the southern inhabitants as pure Arabs. For a very long period they were more or less under the authority of the kings of Yemen, but in the fifth century after Christ they successfully asserted their independence. They did not, however, institute any form of government in place of the one they had overthrown, and for about two hundred years they remained split up into numerous clans engaged in continuous warfare. From foreign invasion the ancient inhabitants were comparatively free. The rulers of the Mesopotamian empires, of Persia, and of Egypt failed to reduce them to submission. Alexander the Great determined upon the invasion of the country, but was interrupted in his plans by death. Three centuries after Alexander, in the reign of Augustus, an army under the prefect of Egypt invaded Yemen: but no definite results followed the expedition. The only considerable period of foreign rule was that between 529 and 605, when Yemen was held by the Abyssinians. The Arabs, therefore, were left to work out their own destinies, and the force that was to unify the warring tribes into one great nation was to come from among themselves.

In Western Arabia, as early as the Fifth Century, the tribe of Koreish, living in Mecca, had risen to great prominence on account of their noble descent and their wealth. In addition to this they became the perpetual guardians of the sacred Kaaba at Mecca. This structure from the earliest times had been a place of pilgrimage for the peoples of the entire peninsula. In the great fairs which were annually held not far from Mecca, the first steps toward Arab unity were made. These annual meetings were marked by the celebration of athletic games, and poetic contests, and partook also of a certain religious character which made them in some respects similar to the Olympian Games of ancient Greece, with which they may also be compared for their effect upon the building up of an Arabian nationality. The way, then, was prepared for Mohammed, who, through the gospel of Islam, was destined to unite the entire peninsula under his rule within the short period of ten years; for after he had won over the powerful Koreish to his doctrine, and had provided himself in this manner with an efficient army, the chaotic condition of political life in Arabia made the spread of his faith all the more easy. Arabia enjoyed the most prosperous period of its history during the reigns of the first three caliphs (632-656), under whom Syria, Egypt, and Persia were conquered. Then the tide of Moslem conquest swept westward over the whole of northern Africa and the Spanish Peninsula, and seemed about to engulf ancient Gaul, when it was arrested between Poitiers and Tours by Charles Martel, ruler of the Franks (732). With the spread of Mohammedan dominion, the importance of Arabia itself declined. This was especially true after the year 750, when the Ommiads were overthrown by the descendants of Abbas. So long as Damascus had been the centre of the Moslem world, the Arab element had been preëminent, and the great generals and administrators of the caliphs had been drawn chiefly from among the inhabitants of the peninsula; but with the establishment of the Abbasside dynasty of caliphs, who removed the seat of the Mohammedan power in the East to Bagdad, and the rise of a great Mohammedan realm in the extreme West the magnificent rôle which Arabia had played came to an end, and the country which had furnished the means of war to Mohammed's immediate successors, fell into the condition in which the prophet had found it in the "Days of Ignorance." Numerous principalities once more arose, enjoying complete independence, except at rare moments, when some foreign invader established his power over sections of the country, as was the case with Yemen, which was for some time held by the rulers of Egypt. In 1517 the tribes of Yemen and Hejaz were subjected under the rule of the Turkish Sultan. In 1633, however, they virtually regained their independence, and the last native ruler in Yemen was not overthrown till 1871. In the East the kingdom of Oman attained considerable importance. From 1508 to 1659 its capital, Muscat, was held by the Portuguese, but it finally fell into the possession of the native princes, who succeeded in extending and consolidating their power. In the interior of Arabia the most important princes are the Wahhabi rulers, whose dynasty was founded in the middle of the Eighteenth Century by Abd al-Wahhab, a religious reformer who attempted to restore the pure faith of Mohammed and banish all later accretions, and made the propaganda of his religious views a means for seizing on political power. Under his successors the Wahhabi sphere of influence expanded until at the beginning of the Nineteenth Century Mecca itself fell into their hands. In 1811 they became involved in conflict with Mehemet Ali of Egypt, and after seven years' warfare their power was shattered by Ibrahim Pasha. The Wahhabi monarchy, however, took a new lease of life after 1840, when the struggle between the Viceroy of Egypt and the Sultan prevented any effective assertion of Ottoman supremacy. The Mohammedan world is even yet not free from danger of a Wahhabi incursion.

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ARABIA DESER'TA (Lat., Deserted Arabia). The name applied by ancient geographers to the northern and central third of the country. It is a region of hard, gravelly soil, diversified here and there by patches of stunted bush and meagre grass.

ARABIA FE'LIX (Lat., Happy Arabia). The name given to the southeastern part of Arabia; a tolerably fertile region.

ARABIAN ART. A term erroneously applied to the art of Mohammedan nations. Nor is there properly a Moorish art. For all such art see the articles MOHAMMEDAN ART; and ARCHITECTURE. The Arabs themselves were never an artistic nation, only patrons of art. Even in Yemen, where the tribes lived not a nomadic, but a sedentary life, only a primitive form of art was developed in antiquity.

ARABIAN GULF. See RED SEA.

ARABIAN MUSIC. The influence of the Arabs upon modern music is distinctly felt in many of our orchestral instruments. Their musical system, however, has left no traces, because it was rather a philosophical and mathematical speculation than a practical system. Although in early times the Arabs had primitive instruments and characteristic melodies, we cannot speak of a distinctly Arabic system of music until after the conquest of Persia by the Arabs in the Seventh Century A.D. With wonderful rapidity the conquerors assimilated the musical art of the conquered, so that in a short time the pupils rose to the position of masters. Since then the music of Persia and Arabia is like two great streams flowing side by side and frequently intermingling. Already in the Eighth Century we find theoretical writings on music by Arabic authors. When Al Farabi, in the Tenth Century, attempted to supplant the Arabic system by that of the Greeks, he failed, because the Arabic-Persian system had already reached a high development. The theoretical founder of the Arabic-Persian school is Sifa al-Din, an Arab by birth, who lived in the Fourteenth Century. The Arabic system constructed a scale by joining together a tetrachord (D, E, F♯, G), and a pentachord (G, A, B, c, d), so that the semisteps are between the third and fourth and sixth and seventh degrees. Each whole tone was divided into three third tones, so that the octave contained 17 third tones. These third tones were not regarded as chromatic alterations of a fundamental tone, but were denoted by the theorists by separate numbers, so that the first tone of the second octave was 18, of the third octave 35. Octaves and fourths are regarded as consonances, thirds and sixths as dissonances. The fifth was a disputed interval. Out of a possible number of 84 scales, the theorists selected 12 as practicable. These were called *Makamat*. Besides these complete scales there were recognized six *Awasat*, combinations of from five to nine third tones, which stood in the same relation to the scales as the tropes of the Plain Chant stood to their respective modes. While the theorists continually introduced new systems of wonderful ingenuity, the practical musicians were guided chiefly by their ear, and this led them to conceive their melodies in a scale corresponding exactly to our D major. The principal instrument of the Arabs was the lute (q.v.), which they adopted from the Persians.

The tanbur had a circular or oval body, a very long neck and three strings. The kanun was a kind of cembalo with seventy-five gut strings (three to each tone) over a square resonator. Among the instruments played with a bow the principal one was the rebab or rebic, which has developed into our violin. The kemangeh was made of a cocoanut over which was stretched a membrane. The strings were fastened on an excessively long and thin neck. The chief wind-instrument was the zamr or zurna, a kind of oboe. The nefyr is a trumpet similar to ours. The nakarich is our kettle-drum. The number of instruments used by the Arabs is enormous. There are 32 kinds of lutes, 12 kinds of kanuns, 14 instruments played with a bow, 3 kinds of lyre, 28 kinds of flute, 22 kinds of oboes, 8 kinds of trumpets, and drums. Consult Land, *Over de Toonladders der Arab. Musick* (Amst., 1880).

ARA'BIAN NIGHTS. An extensive collection of tales forming part of Arabic literature, and the more exact title of which is "The Book of the Thousand and One Nights." Arabic manuscripts vary considerably, no two agreeing either as to the number of separate tales or as to their order. In their most complete form we have 262 tales, though this does not include one of the most famous stories, that of Aladdin, an Arabic text of which has only recently come to light (published by H. Zotenberg). This variation in the manuscripts, while also an index of the popularity which the collection enjoyed, is due to their gradual growth and to the different centres in which the traditions regarding them developed. They were first made known to Europe by Antoine Galland (A.D. 1646-1715), a French orientalist, who succeeded, after much effort, in obtaining a manuscript, which he supplemented by gathering tales from professional story-tellers with whom he came in contact during his travels in the East. Between 1704 and 1717, Galland published in twelve volumes his French translation of the tales which he entitled *Mille et une Nuits, contes Arabes traduits en Français.* While received with great enthusiasm by the general public, doubts were freely expressed in learned circles as to their genuineness. Oriental scholars did not hesitate at first to declare against their authenticity, and denounce them as forgeries. Having taken only an obscure place in the literature of the East, and their style unfitting them from being classed among models of eloquence or taste—having no object of a religious, moral, or philosophical kind in view, while the manners and customs delineated in them were different from all received ideas of those of the Moslem nations—their success took the critics by surprise. It was not long, however, before such skepticism gave way, and they were recognized not only as genuine productions but as a characteristic expression of Eastern thought and manners. The success of Galland's translation spread the tales throughout Europe. Few books have been translated into so many different languages, and given delight to so large a number of readers. In addition to the translations into European languages we must bear in mind that the Arabic original has also been the source of renderings into many Eastern tongues, notably Persian, Turkish, and Hindustani, so that more than any other compilation, with the single exception of the Bible, the *Arabian Nights* has encircled the entire world. It may be said that, in these Oriental tales, there has sprung up a new branch of literature, for their influence on the literature of the present day is easily discernible. Here are found depicted with much simplicity and great effect, the scenes of the town-life of the Moslem. The prowess of the Arab knight, his passion for adventure, his dexterity, his love and his revenge, the craft of his wives, the hypocrisy of his religious teachers, and the corruptibility of his judges, are all dramatically delineated—far more vividly represented, in fact, than is possible in a book of travels; while gilded palaces, charming women, lovely gardens, and exquisite repasts captivate the sense of the reader, and transport him to the land of wonder and enjoyment. Besides entertaining the mind with the kaleidoscopic wonders of a teeming and luxurious fancy, which is their most obvious merit, they present a treasure of instruction upon life in general, and Oriental life in particular. And this is undeniable, notwithstanding the fact that the aspects of society they depict are far from standing high in the social scale either as to civilization or morality. A clue to the origin of the framework of the *Arabian Nights* is furnished by the authors of the bibliographical work *Kitab al-Fihrist.* Ibn Yakub relates that he was acquainted with a Persian collection of tales entitled "Hazar Afsan," meaning "Thousand Nights;" the argument of which, such as described by him, has many points of resemblance with the *Arabian Nights.* In both, the framework is essentially the same—a king who was in the habit when wedding a damsel to kill her after having spent one night with her, and a damsel who entertained a king with stories so fascinating that he respited her each night in order that he might hear the continuation. This continued for a thousand nights, at the end of which period the king decided to preserve his consort's life. Ibn Yakub gives the name of the heroine of the framework in its Persian form, Sharazad, mother of Humai, wife of Artaxerxes Longimanus. As Artaxerxes is supposed to be identical with the Ahasuerus of the Book of Esther, which, as de Goeje pointed out, has certain elements in common with the framework of the *Arabian Nights*, it is probable that they are both derived from a Persian folk tale. The *Arabian Nights*, however, is a most composite production, and whatever its indebtedness may be to the Persian *Thousand Tales*, it contains stories gathered from all parts of the Eastern world. The tales may have circulated for a long time orally before being committed to writing, and to this day they form the theme frequently of the professional story-tellers or writers who are found in the East—in Morocco, Algiers, Egypt, Syria, and Persia. When and where they began to be gathered into manuscripts are questions hard to determine. Thirteen tales which may be regarded as the nucleus of the collection appear to have been reduced to writing as early as the Tenth Century, and while the collection as a whole assumed a definite shape in the Thirteenth Century, there are a few tales which may be as late as the Sixteenth Century.

Regarding the character of the stories and the material contained in them, we may distinguish three categories: (1) Beast fables; (2) Fairy tales; and (3) Anecdotes. Of these, the beast fables represent probably the oldest structure, reverting, as they eventually do, to the primitive beliefs which attributed to animals human powers and evident superhuman faculties. The fairy tales show the Eastern imagination at its best, though it should be remembered that some of the tales are transformed myths that again belong to a more primitive age than one which was able to exercise the imaginative fancy for its own sake, independent of doctrines or of symbolical purposes. Burton assumes that the fairy tale proper in the *Arabian Nights* is "wholly and purely Persian" (*Terminal Essay* to his translation, page 127), and so far as the stimulus toward this branch of literature is involved, he is unquestionably right, for the genuine Arab, while of a highly poetic temperament, is restrained in his fancy through the sober and austere character of his religion, which discountenances the products of the pure imagination. Characteristically Arabic, on the other hand, are the stories introduced to prove a point or to point a moral, while the incidents and anecdotes, historical and otherwise, are likewise the genuine production of the Arabic mind.

In judging of the obscene allusions with which many of the tales are well stocked, and the frankly indelicate manner in which incidents are related that shock Occidental sensibilities, it must be borne in mind that many themes may be discussed in the Orient with perfect simplicity, that would be regarded as improper among us, so that not everything which seems obscene was really intended to be such. But making due allowance for this difference between the Oriental and Occidental point of view, there remains a large residuum of erotic material that is undoubtedly introduced to add piquancy to the tales. Such material, however, has its value for the student of customs and manners, who is given an insight into conditions existing at one time in the Orient which is not to be had in any other way. Indeed, apart from the entertaining character of the tales (when freed from their objectionable features), they abound in references to religious and social customs and manners of thinking that make them a perfect storehouse of valuable material for the one who wishes to study the Orient, and modern scholars have done much toward utilizing this material in their researches regarding Mohammedanism and Arabic antiquities as well as Arabic history.

The best editions of the Arabic text are those of Macnaghton (Calcutta, 1839-1842; lithographed, Bombay, 1879) and the Bulak editions of 1835 (2 vols.) and 1885 (4 vols.). A shorter and at times expurgated text is given by M. Habicht (12 vols., Breslau 1825-1843) and Salhani (5 vols., Beirut, 1888-1890). Galland's French translation (1704) was soon followed by an English rendering, which as early as 1713 had already reached a fourth edition. Of English translations based on the Arabic, there are now three—the first by E. W. Lane, whose edition is abridged (1839-41); a popular edition was published in 1847, *The Thousand and One Nights*. The notes constitute a valuable feature. Lane's edition has been repeatedly reissued, the last one being in six volumes, edited by Joseph Jacobs (London, 1898). John Payne's translation, based upon the Macnaghton MSS. and prepared for the Villon Society, was issued in nine volumes (London, 1882-84). It takes rank with Sir Richard Burton's translation in ten volumes (1885-86), with a "Terminal Essay" embodying the results of Burton's researches as to the origin, age, and character of the tales. To this he subsequently added six supplemental volumes (1887-88), containing tales not included in Macon's edition and drawn from other printed texts and manuscripts. An abridged and expurgated edition of Burton's work was prepared by Lady Burton and issued in six volumes (London, 1887-88). There are four noteworthy translations in German. The earliest was that of Habicht published at Breslau in fifteen volumes, 1824-25. This was followed by a translation by Zinserling, which was based upon the French translation of Hammer-Purgstall (3 vols., Stuttgart, 1823). Gustav Weil's translation appeared in three volumes at Stuttgart in 1838-43. There has been added lately a spirited translation by Max Henning in the Reclam *Universal Bibliothek* (Leipzig, 1896 et seq.). Of these the most reliable is that of Weil. In France Galland's translation has been superseded by that of Mardrus (Paris, 1899, et seq.) and editions have been issued by Caussin de Perceval (Paris, 1806, 9 vols.), Edward Gautier (1822-24, 7 vols.), M. Destain (1823-25, 6 vols.), Silvestre de Sacy (1838, 3 vols.), J. C. Mardrus (1899—).

The success of Galland's venture gave rise to many imitations that appeared in France, England, and Germany, all more or less expurgated and altered to adapt them for popular use. A complete bibliography of the *Arabian Nights* is given in Chauvin, *Bibliographie des ouvrages arabes*, V. (Paris, 1901).

ARABIAN SEA (anciently, Lat. *Mare Erythræum*, or the *Red Sea*) (Map: Asia, F 7). The northwestern part of the Indian Ocean, lying between Arabia, India, and Baluchistan. Its southern limit is generally supposed to be on a line from Cape Comorin, in Hindustan, to Cape Guardafui, in Africa. By the Gulf of Aden it communicates with the Red Sea and also with the Mediterranean through the Suez Canal (q.v.). On the northwest it forms the Gulf of Oman, with its continuation called the Persian Gulf. Among its eastern inlets may be mentioned the gulfs of Cutch and Cambay. The only important river it receives is the Indus, from the east. The most important islands in the Arabian Sea are the Laccadives and Socotra. The commercial significance of the Arabian Sea was very great in ancient times when the products of the Orient were conveyed hither by sea to be transported by caravans to Europe. But with the discovery of the all-sea route to India, in 1497, its importance was lost until the opening of the Suez Canal in 1869 gave a fresh stimulus to commerce in that quarter. At present it is again a busy water thoroughfare. Consult: C. F. Oldham, "Topography of the Arabian Sea," in Volume LXIV. *Asiatic Journal* (Calcutta, 1896).

ARABIA PETRÆ'A (Lat., Rocky Arabia). The northwestern and more hilly region of Arabia, into which *Arabia Deserta* merges.

ARAB'ICI, or ARA'BIANS. A sect in Arabia, in the Third Century, which held that the soul dies with the body and will be raised again with it. Eusebius says that Origen, at their invitation, held a debate with them at a considerable synod, convinced them of their error, and they renounced it.

ARABIC LANGUAGE AND LITERATURE. The Arabic language forms a branch of the South-Semitic tongues, and with the exception of Aramaic (q.v.) is the only Semitic speech which deserves to be called a living tongue. It is still spoken in Palestine, Syria, Mesopotamia, Arabia, Egypt, northern Africa, and Malta, and it is more or less understood in all countries into which Mohammedanism has penetrated. We may distinguish between the so-called (a) classical Arabic of the old poets, the Koran and the schools; (b) the Middle-Arabic of the post-classical period; and (c) Modern Arabic, which is subdivided into the following chief dialects: (1) of Syria and Palestine; (2) of Egypt; (3) of Mesopotamia; (4) of Oman and Zanzibar; (5) of Tunis, Morocco and Algiers; (6) of Malta; and (7) the Mehri in South Arabia, the ancient form of which is preserved in the Minæan and Sabæan inscriptions (see Minæans: Sabæans). The distinguishing features of the language are an exceedingly extensive vocabulary and complicated grammatical forms. The Arabic alphabet, which is derived through the Nabatæan (see Nabatæans) from the ancient Aramaic script, consists of twenty-eight characters, of which eleven, however, are merely distinguished by diacritical points placed above or beneath, so that there are only seventeen distinct characters used. The direction of the writing is from right to left.

Arabic literature may be broadly divided into two periods, the first containing the Arabic national literature, extending to the close of the Ommiad dynasty, c.750 A.D., and the second containing the Islamic literature in Arabic. In the second period four subdivisions may be noted: (a) c.750 to c.1000, when literary activity reached its height; (b) c.1000-c.1258, the post-classical period; (c) c.1258-1517, the period of decline and decay; and (d) 1517 to the present time. Nothing has survived earlier than the time of Mohammed except in verse, in which the pre-Islamic Arabs attained a high degree of proficiency. They had poetical tournaments, and the poets vied with each other at such annual fairs as that held at Okaz (Ar., *'Ūkāṣ*), near Mecca. The subjects treated were tribal strifes, vengeance, love, friendship, and hospitality. The most celebrated of these are those called *Mu'allaḳāt*, comprising the poems of Amru al-Kais, Tarafah, Zuhair, Labid, Amr ibn Kulthum, Antarah and al-Harith, though, according to some collectors, Nabighah and Asha take the place of the last two. Fragments of the productions of more than two hundred pre-Islamic poets, among whom were Jews and Christians, were collected in the tenth century. The largest collections are the *Ḥamāsah* of Abu Tammam (846); the *Kitāb al-Aghānī* (Book of Songs) of Abu al-Faraj al-Isfahani (967), and the *Jamharat ash'ār al-'Arab* of Abu Zaid (tenth century). A new period began with Mohammed (571-632). The Koran, which gave birth to a religion and which founded the greatest politico-religious system of the Middle Ages, soon dominated all branches of intellectual activity. The earliest products of this domination were grammar and lexicography, the necessary instruments for the exegesis of the Koran. Schools were founded in Basra, Cufa, and Bagdad, where the sciences were studied, especially by Persian Mohammedans. Such a one was the first grammarian of Basra, Abd al-Rahman ibn Hormuzd (c.730). Among the noteworthy grammarians and lexicographers may be mentioned: Abu al-Walid al-Duali (eighth century), the inventor of the diacritical points; al-Khalil, the founder of Arabic metrics and the author of the first Arabic lexicon, *Kitāb al-'Ain;* Sibawaihi (796), author of an extensive grammar (translated into German by Jahn, Berlin, 1894); Ibn Duraid (d.934), author of the lexicon *al-Jamharah;* Ismail ibn Abbad al-Sahib (d.995), author of the lexicon *al-Muhīṭ;* Ibn Mukarram (d.1311), author of an extensive lexicon, *Lisān al-'Arab;* al-Zamakhshari (d.1143), author of a grammar *al-Mufaṣṣal,* and a lexicon *Assās;* and Ibn Malik (d.1273), who wrote a grammar in one thousand verses under the title *Kitāb al-Alfīyah.*

As all Mohammedan philosophy, theology, law, and statecraft is derived primarily from the Koran, its interpretation became the object of discussion at a very early period. Hence an immense literature of commentaries and super-commentaries grew up, only the most important of which can be mentioned: those by al-Tabari (d.923), al-Hasan al-Nisaburi (d.1015), Mohammed al-Kurtubi (d.1272), of al-Zamakhshari (d.1143), of Fakhr al-Din Razi (d.1209), of al-Baidawi (d.1286), and Jalal al-Din al-Suyuti (d.1505). But Mohammedanism, as a system, rests as much upon the oral as upon the written law. The sayings and doings of Mohammed and his immediate followers form the science of the Hadith or traditions, which vary both as to value and authenticity. Around these there has also grown up a large literature; the three great collections of such traditions were made by al-Bukhari (d.870), Muslim (874), and al-Tirmidhi (892).

As early as the end of the seventh century a school of Mohammedan jurisprudence was founded in Medina by Abd Allah ibn Masud and Abd Allah ibn Abbas. Its decisions were collected toward the end of the eighth century by the distinguished jurist Malik ibn Anas, whose *al-Muwaṭṭa'* became the code for the Hejaz, Tunis, Algeria, and Morocco. There are three other recognized codes, of Abu Hanifah (q.v.), of Mohammed al-Shafii (d.820), and of Ahmad ibn Hanbal (d.855). Other codes, to the number of seventy-two, are prescribed as heretical. These have produced an extensive literature of commentaries and pandects, which has not exhausted itself in our own days.

The activity of the Mohammedans was not confined to philological and theological studies. With the accession of the Abbassides a new field was opened by the introduction of foreign civilizations. Learned men were invited from other countries and remunerated in a princely manner. The works of Greek, Syriac, Old-Persian, and Indian writers were translated into Arabic. Schools of philosophy were founded at Bagdad, Cordova, Cairo, etc., where the writings of Aristotle, Plato, and the Alexandrine philosophers were expounded and commented upon. Dogmas, hitherto regarded as sacred, were freely discussed and rejected. (See Mutazilites.) From these schools issued the philosophers al-Kindi (eighth century), al-Farabi (960), Ibn Sina (Avicenna 980-1037), al-Ghazzali (1111), Ibn Badiah (1138), Ibn Tufail (d.1185), and Ibn Roshd (Averroes, 1153-98), whose works, subsequently translated into Latin, were studied for many centuries in European universities.

In mathematics the Mohammedans made great advances by introducing the numerals and other modes of notation, the sine instead of the chord, and by extending the application of algebra. Astronomy was zealously cultivated in the schools of Bagdad, Cairo, and Cordova. According to Ibn al-Nadbi (1040), the library at Cairo possessed two celestial globes and six thousand astronomical works. In the ninth century the three sons of the librarian, Musa ibn Shakr, calculated accurately the diameter of the earth and the precession of the equinoxes. At the same time lived al-Farghani, author of an astronomical encyclopædia, which was translated in the twelfth century by Johannes Hispalensis. In the tenth century al-Battani (Albatagnius) flourished, to whose name is attached the introduction of trigonometrical functions, and the observation of the obliquity of the ecliptic. Among the astronomers whose works were translated into Latin may be mentioned Thabit ibn Kurrah (901), Jabir ibn Aflah, who in 1196 constructed the first observatory at Seville, and Nasir al-Din al-Tusi, the paraphraser of Euclid. Medicine and natural history were cultivated by the Mohammedans with a like success. In the seventh century the writings of Galen, Hippocrates, Paul of Aegina, etc., were translated from the Greek into Arabic. Ibn Abi Usaibiah (1203-69) devotes a whole volume to the medical literature in Arabic. Among the medical writers may be mentioned Mohammed al-Razi (tenth century), whose works were translated into Latin; Ali ibn Ridwan (1061); Ibn Sina (Avicenna); Abu al-Kasim (1107), who wrote on surgery and surgical instruments; Abd al-Malik ibn Zuhr (1162), and Abd Allah ibn al-Baitar (1248), whose Materia Medica had great vogue.

History in all its forms was cultivated at an early time by the Mohammedans; several chronicles were written in the days of the Ommiad dynasty. Persian historiography influenced the Arabs to record the events of their past life as a people; and the growing interest in the prophet and his times furnished a healthy stimulus. From the middle of the eighth century we have an uninterrupted series of historians. The earliest of these were Mohammed ibn Ishak (768), whose biography of Mohammed was enlarged by Ibn Hisham (821), and Mohammed al-Wakidi (823), who wrote the history of the prophet at Medina. No less than 140 titles of works written by al-Kalbi (c.819) are mentioned, dealing largely with history and genealogy. It was a Persian, Abu Jafar al-Tabari (838-923), who produced the first universal history in Arabic, beginning with creation. A similar work was produced by Ibn al-Athir (1160-1234). Of the early historians mention must also be made of Ibn Kutaibah (892) and al-Baladhuri (892), who deals especially with the early conquests of the Arabs. In the tenth century wrote al-Hamdani (945), Hamzah al-Isfahani (961), and al-Masudi (956), who has left us a history of civilization. Among the historians of later centuries mention may be made of Ibn Maskawai (1030), al-Makin (1273), Ibn al-Amid (b.1254), al-Biruni (1308), historian of chronology and the Herodotus of India, Abu al-Fida (1331), and Ibn Khaldun (1406), the first to compose a philosophy of history. The chief historians of Spain were Ahmad al-Dhabbi (1195), Ibn Bashkuwal (1182), Mohammed ibn al-Abbar (1259), and Ahmad al-Makkari (1631). Among the noted historians of Egypt were Abd al-Latif (1231) and al-Makrizi (1441). More characteristic of Arabic historiography are the numerous local histories and biographical monographs produced. Among the most remarkable of these are the works of Jalal al-Din al-Suyuti (1505), author of 510 works, among which were histories of Cairo and Damascus; of Abu Ubaidah (824), author of 105 monographs, among which are histories of Mecca and Medina; of Ali ibn Asakir (1175), author of a history of Damascus in eighty volumes, and of Baha al-Din ibn Shaddad (1234), author of a history of Aleppo. Mohammed al-Shahrastani (1153) wrote a history of religious and philosophical sects which is still our chief authority on the subject. The most noteworthy biographical writers were Abu Zakariyah, al-Nawawi (1274) and Ibn Khallikan (1282), who treats of 865 persons. Bibliography was treated of by Mohammed ibn Ishak al-Nadim (995), Ali ibn Yusuf al-Kifti (1248), and Hajji Khalfa (1658). With the exception of Ibn Khaldun the Arabic historians lack critical sense; they are mostly mere chronographers. In geography they displayed much greater ability and have left us works of lasting value. The chief geographical writers are Ibn Hisham, Khurdadhbah (912), Masudi, Ahmad ibn Fadlan (921), Abu Ishak al-Istakhri (tenth century), Ibn Haukal (977), al-Mukaddasi (985), the traveller Ibn Batutah (1377), Yakut (1178), who, like al-Bakri (1094), wrote an extensive geographical dictionary, al-Kazwini (1276) and Abu al-Fida.

Besides these advances in the solid branches of knowledge the genius of the Arabs continually flowered into poetry. From Bagdad to Cordova the Mohammedan world was full of sweet singers. Collections of the works of older poets (*Dīwāns*) were made, of single writers, of the poems of individual tribes, or arranged according to the subject matter of the poems. Umar ibn Rabiah (1328), the Arabian Minnesinger; Abu Nuwas, the Heine of the court of Harun al-Rashid; the royal poets Abd al-Rahman (788) and Al-Mutamid (1095) of Spain; Muslim ibn al-Walid (757); Abd Allah ibn al-Mutazz (1502); Abu Firas (968); al-Tughrai (1120); and the panegyrist of Mohammed, al-Busiri (1279), are a few of the brightest stars. Though much of this poetry was scholastic in form, al-Mutanabbi (965) is considered one of the greatest Mohammedan poets and his *Dīwān*, with its 289 poems, was always widely read. A new species of poetry was invented, the *Makāmāt*, a sort of rhymed prose in a finished and most ornamental style and exhibiting merely the literary prowess of the writer. Of such a kind were the writings of Ahmad al-Hamadhani (1007) and Abu Mohammed al-Hariri of Basra (1121). Side by side with this scholastic poetry there grew up a large mass of popular verse, which refused to be bound by the canonical metres and which developed the strophe, otherwise unknown to Arabic literature. A particular form of this was the *Muwashshah*, or girdle poem. A popular, and at times fantastic popular prose literature also made its appearance, in which the Eastern craving for the wonderful and gorgeous was richly gratified. This was largely influenced by non-Arabic literatures, as in the *Fables of Bidpai*, translated in 750 by Abd Allah ibn al-Mukaffa from the Persian, in *The Seven Wise Masters*, and in the *Arabian Nights* (q.v.). Pure Bedouin romances are the stories of *Saif ibn dhi Yazan*, of the *Banu Hilāl*, of *al Zir*, and especially the *Antar Romance*, which gives the most faithful picture of desert life, and which was not without influence upon the romance and chivalry of mediæval Europe.

All this culture of the early centuries of Mohammedanism presents a strong contrast to the decline which is evident from the ascendancy of the Turks in the sixteenth century to our own day. Scholastic discussions on dogmatics and jurisprudence, and tedious grammatical disquisitions became the order of the day. The expedition of Napoleon to Egypt presaged the introduction of Western culture to the East, and a slow intellectual resurrection has commenced. The printing presses of Bulak, Fez, Constantinople, Beirut and of several Indian cities are extremely productive, and edition after edition is quickly exhausted. Newspapers in Arabic are now published all over the East, and even in Western cities, e.g. Paris and New York. Writers have also begun to attempt, with more or less success, to imitate European forms of thought and sentiment. Of these may be mentioned Michael Sabbagh of Syria (*La Colombe Messagère*, Arabic and French, Paris, 1805); the Sheik Rifaa of Cairo (*The Broken Lyre*, Paris, 1827); *Manners and Customs of the Europeans* (Cairo, 1834); *Travels in France* (Cairo, 1825). But despite all this, the results obtained in Egypt during the period from 1798 down to the English tutelage, in 1882, are meagre. Mehemet Ali introduced the printing-press in 1821, and founded a school for mathematics. Some of the works of the best European writers were translated into Arabic; the vice-regal library was founded in Cairo in 1870. Few great scholars and writers have as yet appeared; and it is questionable whether the attempt to develop the common speech into a literary language will be more successful. The endeavor to substitute the Roman script for the Arabic (furthered notably by Professor W. Fiske) will certainly not aid the regeneration. The following modern poets deserve mention: Hasan al-Attar (1766-1838); Abd Allah Pasha al-Fikri (1834-90); Aisha Ismat Hanun, daughter of Ismail Pasha; and Mohammed Uthman Jalal (b.1829), the translator of Racine and Molière. To these may be added the historians Abd Allah al-Sharkawi (1737-1812), and Abd al-Rahman al-Jabarti (d.1826), both historians of the French occupation; Ali Pasha Mubarak (1823-93), the topographist of Cairo and Alexandria; and the great jurist Ibrahim al-Bajuri (1783-1861), rector of the al-Azhar University. In Syria the dearth of literary effort was still greater. The beginnings of a new life are due to European and American efforts. The American Presbyterian missionaries and the French Jesuits (since 1869) have started a new life in Beirut by means of the printing-press and modern schools. A real interest in the old literature has been awakened, many of the masterpieces being reëdited in a critical spirit. In this connection may be mentioned the philologist and poet Nasif al-Yaziji (1800-71), who wrote the critical observations in De Sacy's edition of Hariri (*Epistola Critica*, Leipzig, 1848); Butrus al-Bistani (1819-1883), author of a dictionary and a general encyclopædia; Ahmad Faris al-Shidyak (d.1884), the grammarian; Khalil Sarkis (1877), the historian of Jerusalem; and Louis Cheikho, the learned editor of the old Arabic poets. In the old home of the faith, Mecca, literary activity still continues to our own day, but upon the old theological and dogmatic lines. Worthy of mention are Ahmad Dahlan (c.1880), theologian and historian, the author of more than twenty works, and Mohammed ibn Omar al-Nawawi (c.1885), by origin a Malay, the author of eighteen works upon different subjects. In India European influence in literature is confined to the publications of the *Biblica Indica;* and to a few writers such as Siddik Hasan, husband of the Sultanee of Bhopa. The same condition prevails in the Maghrib (Northwest Africa). French culture has had no perceptible influence upon Arabic literature in Algiers; Morocco is as dead to European influences as if it were in the heart of Arabia. The productions of the lithographic press at Fez are all confined to the older Islamic theological, legal, and historical literature.

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ARABIC NU′MERALS. See Numerals; and Algorism.

ARABIC VER′SIONS. See Bible.

AR′ABIN. The chief constituent of gum-arabic, obtained by precipitating an acidulated aqueous solution of gum-arabic with ordinary alcohol.

ARABI PASHA, ȧ-rä′bê pȧ-shä′, properly Ahmed Arabi (c. 1841—). Leader of the national party in Egypt in 1882. He was born of fellah parents in Lower Egypt, and his early youth was spent as a laborer. He served for twelve years as a private soldier in the Egyptian army, and gradually rose to the rank of colonel. He took advantage of the discontent which prevailed in Egypt on account of the foreign influence to organize a rebellion on the issue of "Egypt for the Egyptians." The lack of energy shown by the Khedive Tewfik permitted Arabi to acquire great influence. He participated in the revolt against Nubar Pasha, obtained the removal of the ministry, and entered the new cabinet as minister of war (1882). In this position he became a virtual autocrat, setting aside the Anglo-French financial control. England now intervened and a war ensued. On July 11-12, 1882, an English fleet bombarded Alexandria. Arabi withdrew, and the British undertook a vigorous campaign against him, completely defeating him September 13, 1882, at Tel-el-Kebir. He surrendered the following day, and a sentence of death was passed upon him, but it was commuted to life exile in Ceylon. The movement he had headed collapsed, and its only result was the permanent establishment of British control in Egypt. He was pardoned by the British Government in December, 1900, and permitted to return to Egypt in 1901.

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ARABKIR, ä′rȧb-kēr′. A town of Asiatic Turkey, about one hundred and seventy miles northwest of Diarbekr (Map: Turkey in Asia, H 3). It lies on the route from Aleppo to Trebizond and is of considerable commercial importance. Population estimated at from 25,000 to 30,000, including a considerable number of Armenians.

AR′ABY. A poetical form, especially current in the Renaissance, for Arabia.

ARACAJU, ä′rȧ-kȧ-zhōō′. The capital and chief port of the Brazilian State of Sergipe, situated about seven miles from the coast on the river Cotindiba (Map: Brazil, K 6). The city is regularly built and contains an agricultural school. It is connected by rail with Capella and Signão Diaz in the interior, and has an estimated population of 6000, including a number of Indians.

AR′ACAN′. See Arakan.

ARACARI, ä′rȧ-kä′rê (Port.). A toucan of the genus Pteroglossus. See Toucan.

ARACATÍ, ä′rȧ-cȧ-tē′. A port in the State of Ceará, Brazil, on the river Jaguaribe, ten miles from its mouth, and seventy-five miles southeast of Ceará (Map: Brazil, K 4). Its harbor is shallow, with a shifting bar at the entrance, but can be entered at high tide. Its exports are hides, cotton, and sugar. It maintains regular steamship communication with Pernambuco, and has a population of about 6000. It was founded in 1723.

ARA′CEÆ. See Arum.

ARACHIS, ăr′ȧ-kĭs. See Peanut.

ARACHNE, ȧ-răk′nê (Gk. 'Αράχνη, *arachnē*, lit. spider). The mythical Lydian girl who, having excited Athene's anger by challenging her to a contest in weaving, was changed by the irate goddess to a spider. Her fate, and especially her skill with the shuttle and the loom, have been a favorite theme among the poets.

ARACH′NIDA (Gk. ἀράχνη, *arachnē*, a spider). A class of air-breathing arthropods including the mites, scorpions, spiders, and a few other less well-known groups. The typical Arachnida have the head and the thorax more or less fused into a "cephalothorax," four pairs of legs, and no antennæ, the maxillary palps functioning as antennæ. The eyes are all simple, and vary in number from two to twelve. By the number and arrangement of these eyes the species of spiders are determined. The abdomen possesses no true legs, but the three abdominal spinnerets of spiders are homologous with legs. Besides the spinneret-glands in the abdominal region of spiders there are poison-glands in the last abdominal segment of scorpions, located at the base of the sting. In other forms the poison is emitted through the hollow jaws. The Arachnida breathe by means of tracheæ, like other insects, or by means of sacklike bodies called "lungs" that open on the under side of the abdomen; but some forms breathe by both tracheæ and lungs. All the Arachnida are carnivorous save some of the mites, which live on plant-sap. Most of the animal-feeders prey upon other insects, and hence are the friends of agriculture. A few forms are parasitic on warm-blooded vertebrates and fish, and cause or accompany such diseases as itch and mange. The history of this class goes back to Palæozoic times.

Classification.—The Arachnida are divided into seven orders: (1) Solpugida, or wind scorpions; (2) Scorpionida, or scorpions; (3) Pseudoscorpionida, book-scorpions; (4) Pedipalpida, or whip-scorpions; (5) Phalangida, or harvestmen; (6) Araneida, or spiders; and (7) Acarida, or mites. The following groups are believed by many to fall into the class Arachnida, but their relationships are doubtful: Linguatulida, or tongue-parasites of the dog; Tardigrada, or water-bears; Pycnogonida, or sea-spiders; Xiphosura, or king-crabs. See Mites; Scorpions; Spiders; Harvest-Man.

ARACH′NOID MEM′BRANE. One of the three coverings of the brain and spinal cord. It is a thin, glistening membrane, which, by its parietal layer, adheres inseparably to the dura-mater on its outer side, and more loosely to the pia-mater, which is between it and the brain substance. Between the pia-mater and the arachnoid membrane in some situations there are considerable intervals (sub-arachnoid spaces). See Nervous System and Brain.

A′RA CŒ′LI (Lat., Altar of Heaven). The name given to the famous church of the Virgin erected on the summit of the Capitoline Hill in Rome. It was the only Christian edifice on the Capitol, and was for centuries called Sancta Maria in Capitolio; but popular legend connected it with the possession by Christianity of the stronghold of Paganism, and the Middle Ages imagined a dream of Augustus, to whom the Sibyl announced that here was the altar of the Son of God; hence *Ara Cœli.* The church took over all the celebrity of the pagan Capitol, and was the meeting-place for the city council and the people.

ARAD, ŏr′ŏd. Two towns of the Kingdom of Hungary. (1) Old Arad (Hung. *O-Arad*). The capital of the county of Arad, situated on the right bank of the Maros, a tributary of the Theiss, about thirty-seven miles north of Temesvár (Map: Hungary, G 3). The town has many handsome streets and fine modern buildings, such as the theatre, town-hall, and the palaces of justice and industry. The former strong fortifications are now rather out of date. Arad is the seat of a Greek-Oriental and of a Rumanian bishop. It is one of the most important industrial towns of Hungary. Its manufactures include alcohol (one of the largest distilleries in Europe), starch, leather, and machinery. There is also a considerable export trade in grain, tobacco, wine, and cattle. Population, in 1890, 42,050; 1900, 56,260.

During the Seventeenth Century it was often captured by the Turks. Its new fortifications, erected in 1763, made Arad an important position in the Revolutionary War of 1848-49, when it was occupied for a considerable time by the Austrian general, Berger, who capitulated here in July, 1849. From this place Kossuth issued the last proclamation to the Hungarian patriots. After the capitulation at Világos, August 13, 1849, Arad was surrendered to the Russians by the order of Görgey. Here, on October 6th of the same year, a number of Hungarian generals were executed by order of the Austrian commander, Haynau.

(2). New Arad (Hung. *Uj-Arad*). A town in the county of Temes, on the left bank of the Maros opposite Old Arad, with which it is connected by a long wooden bridge. It has a large trade in flour and wood. Population, 1900, 6000.

AR′ADUS (now Ruad). An ancient Phœnician town situated on a small island of the same name, about 35 miles north of the town of Tripolis (Map: Turkey in Asia, F 5). Strabo says that the city of Aradus was founded by fugitives from Sidon. It was independent, ruled over the adjacent coast, and assisted the Macedonians in the siege of Tyre. In 638 the Caliph Omar's commander destroyed Aradus, and it was not rebuilt. The ruins show that it was once a very strong place. The Hebrew name of the town was Arvad. The present village of Ruad has a small population.

ARAF, är′åf, or more accurately **AL A'RĀF**. The name given in the Koran (Sura vii. 44) to the partition separating heaven from hell. Mohammed vividly portrays those standing by the partition saluting the happy inhabitants of Paradise without being able to enter it, while on the other hand they are also terrified at the sight of those who are condemned to the tortures of hell-fire. In Mohammedan theology, El-Araf is a sort of limbo for those whose good and evil works so balance one another that they cannot enter Paradise until the last day of judgment; but in addition to this class, there are others who, according to the views of some theologians, are consigned to El-Araf.

ARAFAT, ä′rȧ-făt′, Mount, or Jebel al-Rahmah (Mount of Mercy). A granite hill some twelve miles east of Mecca. According to the Mohammedans, when Adam and Eve were cast forth from Paradise for eating the wheat which deprived them of their pristine purity, Adam fell at Ceylon, and Eve on Mount Arafat; and after much wandering, Adam finally joined Eve on this mountain. The mount is about two hundred feet high and a mile and a half in circuit. The mount is the real goal of the Mohammedan pilgrimage to Mecca, for while the visit to the Kaaba—the sanctuary at Mecca—may be made at any time, it is known as the "small pilgrimage." The "great pilgrimage," which ends with a visit to Arafat, can only be made in the month *Dhu al-Hijjah*, i.e. "month of pilgrimage." The ninth day of this month, the most sacred of the year, is spent by the pilgrims at Arafat, to which they proceed in a body on the evening of the eighth day. The day is spent in prayers and in listening to a sermon which always lasts many hours. See Burton's account in his *Pilgrimage to El-Medina and Kaaba, Mecca and Medina*, chapter xxviii. See, also, Kaaba; Mecca; Islam.

ARAGO, ă′rȧ-gō; *French pron.* ȧ′rȧ′gō′. Dominique François (1786-1853). A celebrated French astronomer and natural philosopher, born at Estagel, near Perpignan, in the Department of Basses-Pyrénées. At the age of seventeen he entered the Ecole Polytechnique at Paris, where the spirit, promptitude, and vivid intelligence he exhibited in his answers to the questions of Legendre excited the admiration of every one. In 1805 he became secretary to the Bureau des Longitudes at Paris. Two years afterwards he was engaged, with Biot and others, by the French Government, to carry out the measurement of an arc of the meridian, which had been commenced by Delambre and Méchain. Arago and Biot had to extend it from Barcelona to the Balearic Islands. The two savants established themselves on a lofty summit near the eastern coast of the Spanish peninsula, where they lived for many months, communicating by signals across the Mediterranean with their Spanish collaborators in the little isle of Iviza. Before Arago completed his calculations, Biot had returned to France, and war had broken out between France and Spain. Arago was now held to be a spy; his signals were interrupted; and with great difficulty he succeeded in making his escape to Majorca, where he voluntarily imprisoned himself in the citadel of Belver, near Palma. At last he obtained his liberty on condition of proceeding to Algiers, which he did; but on his way back to France was captured by a Spanish cruiser, and sent to the hulks at Palamos. He was, however, liberated after a time and sailed once more for France; but almost as he was entering the port of Marseilles, a tempest arose which drove the vessel across the Mediterranean all the way back to the coast of Africa, landing it at Bougia. He went by land to Algiers, where he was compelled to remain about half a year, and whence he again set out for Marseilles in the latter part of June, 1809. After having narrowly escaped another capture by an English frigate, Arago finally found his way to Marseilles. As a reward for his sufferings in the cause of science, the Paris Academy of Sciences suspended its standing rules in his favor; and though only twenty-three years of age, he was elected member in the place of Lalande, who had just died, and was appointed professor of analytical geometry and geodesy in the Ecole Polytechnique. Afterwards, his attention was devoted more to astronomy, magnetism, galvanism, and the polarization of light. In 1811 he read before the Academy a paper of fundamental importance on chromatic polarization. In 1812 he began his extraordinary course of lectures on astronomy, etc., which fascinated all Paris — the savants by their scientific rigor and solidity, the public by their brilliancy of style. In 1816, along with Gay-Lussac, Arago established the *Annales de Chimie et de Physique*, and demonstrated the value of the undulatory theory of light. In the same year he visited England, making the acquaintance of various persons distinguished in science, especially Dr. Thomas Young. In 1818 appeared his *Recueil d'observations géodésiques, astronomiques et physiques*. In 1820 he turned his facile and inventive genius into a new channel, and made several important discoveries in electro-magnetism. Oersted had shown that a magnetic needle was deflected by a voltaic current passing along a wire. Arago pursued the investigation, and found that not only a magnetic needle, but even non-magnetic substances, such as rods of iron or steel, were subject to deflection, exhibiting during the action of the voltaic current, a positive magnetic power, which, however, ceased with the cessation of the current. Some time after, he demonstrated that a bar of copper, and other non-magnetic metals, when moved circularly, exert a noticeable influence on the magnetic needle. For this discovery of the development of magnetism by rotation, he obtained in 1825 the Copley Medal of the Royal Society of London, and in 1834, when he again visited Great Britain, especial honors were paid to him by the friends of science in Edinburgh and Glasgow. Four years previous to this second visit to Great Britain, he was made perpetual secretary of the Academy and director of the observatory, a position which he retained till his death. As secretary of the Academy he wrote his famous *éloges* of deceased members, the beauty of which has given him so high a place among French prose writers. In politics, too, his career was remarkable. He was a keen Republican, and took a prominent part in the July Revolution of 1830. In the following year he was elected by Perpignan as member of the Chamber of Deputies, where he occupied a position on the extreme Left. In the February Revolution of 1848, he was chosen a member of the Provisional Government, and appointed minister of war and marine. In this position he resisted the proposed measures of the Socialist Party, regarding the Constitution of the United States as the ideal of democracy. His popularity in his own department was the means of preventing the discontented population of Basses-Pyrénées from proceeding to lawless and violent measures. He opposed the election of Louis Napoleon to the Presidency, declared himself against the policy of the new Ministry, and refused to take the oath of allegiance after the coup d'état of 1851. Napoleon, in a letter, paid a high tribute to his talents and virtues, and excused him from taking the oath as director of the observatory. In his general character Arago was sociable, and a brilliant conversationalist. He was the intimate friend of Alexander von Humboldt. His collected works, edited by Barral, were published in Paris (17 vols., including a biography of Arago, 1854-62). Alexander von Humboldt wrote an introduction to the German translation of Arago's works.

ARAGO, ETIENNE VINCENT (1803-92). A French dramatist and politician, a brother of the famous scientist, Dominique François Arago (q.v.), born near Perpignan, Basses-Pyrénées. He was the author, with various collaborators, of a large number of comedies and vaudeville pieces which were successfully produced in Paris, among them *Les Pages de Bassompierre* and *Les Mémoires du diable*, and was director of the Vaudeville from 1829 to 1840. As a journalist, he was one of the founders of *La Réforme*, an advanced Republican newspaper. His poetical comedy, *Les Aristocraties* (1847), the success of which at the Théâtre Français was ended only by the Revolution of 1848, was an expression of the same radical sentiments which made him, as a member of the Constituent Assembly, an opponent of Louis Napoleon's pretensions, and caused his own exile (1849-59). His highest political station had been as director-general of the post-office for several months in 1848. Upon the restoration of the Republic in 1870, he resumed a position of influence, being for a short time mayor of Paris. In 1871 he was elected to the National Assembly, but soon resigned. He became archivist of the Ecole des Beaux Arts in 1878, and later director of the Musée du Luxembourg.

ARAGO, FRANÇOIS VICTOR EMMANUEL (1812-96). A French politician, son of the astronomer. He became an ardent Republican, and on February 24, 1848, when the abdication of the King was announced in the Chamber, Arago, who had penetrated thither, demanded the deposition of the Orleans family, and protested in the name of the people against a regency. Under the provisional government, he was sent to Lyons as commissary-general, and prevented a serious insurrection by applying half a million francs to relieve immediate distress. A little later he was elected to the Constituent Assembly, and was soon sent as envoy to Prussia, where he interested himself for the oppressed Poles, procuring the liberation of General Microlawski. He resigned as soon as Louis Napoleon was elected to the presidency, and became in the Constituent, and later in the Legislative Assembly, one of the future Emperor's most active opponents, vigorously protesting against the expedition to Rome. After the coup d'état (December 2, 1851), he quitted political life and returned to his law practice, but in 1870 became a member of the Government of National Defense, first as minister of justice, and later as minister of the interior, replacing Gambetta in the latter office. In 1871, he was elected a member of the National Assembly, and on the organization of the Senate in 1876, he was elected to that body, where he sat until his appointment as Ambassador to Switzerland in 1880. He retired in 1894.

ARAGO, Jacques Etienne Victor (1790-1855). A French traveler and writer, brother of the astronomer. In 1817 he accompanied an expedition, under Freycinet, in a voyage round the world. Afterwards he wrote plays, poems, and novels, and in 1835 undertook the management of the theatre at Rouen, but having become blind in 1837 he resigned. His early voyage he described in two books of travel: *Promenade autour du monde* (1822), and *Voyage autour du monde* (1838). In 1849, though deprived of sight, he formed a company of speculators and started for California in search of gold. But his companions deserted him at Valparaiso. On his return, he published his painful experiences, under the title, *Voyage d'un aveugle en Californie et dans les régions aurifères* (1851). He died in Brazil.

ARAGON, ăr'ȧ-gon. A captaincy-general of Spain and former kingdom, situated in the northeastern part of the country, and bounded on the north by the Pyrenees, which separate it from France, on the east by Catalonia and Valencia, on the south by Valencia and New Castile, and on the west by New and Old Castile (Map: Spain, E 2). It comprises the three provinces of Saragossa, Teruel, and Huesca, with a total area of 18,298 square miles. The southern and northern parts of the country are mostly mountainous, while the central portion is occupied by a plain, intersected by the Ebro and its tributaries. The climate is varied, owing to the difference in the elevation of the surface. In the mountains it is cool, while in the lower parts it is exceedingly hot and dry.

This difference in the climate is accompanied by a corresponding variation in vegetation, and the agricultural products of the region embrace both the hardier grains, such as corn and wheat, as well as delicate fruits like the olive and vine. Agriculture is in a backward state owing in part to scarcity of population, but chiefly because of the burdens laid by the Government on agrarian communities. In the Province of Teruel are found deposits of sulphur, copper, lead, and salt, which are mined to some extent. The manufacturing industries are confined to the production of linen and woolens and some leather goods. The commerce of the region is insignificant both on account of the agricultural and industrial backwardness, as well as of the lack of transportation facilities. Population, 1887, 883,830; 1897, 892,246; 1900, 912,711. Capital, and seat of the Captain-General, Saragossa.

Aragon came into the possession of Rome after the overthrow of the Carthaginian power in Spain, and was made a part of the Province of Hispania Tarraconensis. It was conquered by the Visigoths early in the Fifth Century, and these in turn were subdued by the Moors after 711. A remnant of the Christian inhabitants who escaped to the mountains and settled in the region between the Sierra de la Peña and the Pyrenees, managed to maintain their independence. For a long time Aragon was ruled by counts of Gothic origin. Subsequently it was incorporated with Navarre, but in 1035 it attained its independence under Ramiro I., the son of Sancho the Great, and now made its appearance as a kingdom. Hemmed in by Navarre on the west and by the little State of Sobrarbe on the east, Aragon, of necessity, took a southward expansion. A long conflict was carried on with the Arabs, amounting, perhaps, to nothing more at times than mere guerrilla raids, but resulting in the gradual acquisition of individual strongholds and towns. On the capture of Huesca in 1096, the capital of the country was removed from the mountain valleys to the plateau of northern Spain. The conquest of Saragossa in 1118 brought the valley of the Ebro under the rule of the kings of Aragon. In 1137 Aragon was united with Catalonia by the marriage of Petronella, the daughter of Ramiro II., with Count Raymond Berengar IV. of Barcelona. This union at once raised Aragon to a predominant position in the Iberian Peninsula. Through the activity of the seafaring population of Catalonia, the kings of Aragon gained possession of the Balearic Islands, Sicily, Sardinia, and Naples in the course of the two following centuries. At the same time the consolidated strength of the kingdom was directed against the Mohammedans, and in 1238 the important city of Valencia, with the surrounding region, fell into its power. During the later Middle Ages, Aragon possessed the freest political institutions in Europe. The power of the King was greatly limited by the privileges enjoyed by the towns, which in effect formed a republican State within the monarchy. Their affairs were administered by municipal officers and their representatives met in *juntas*, which were charged with the maintenance of public safety and the control of common affairs. At the head of the united towns stood the Justiciar of Aragon, to whom, on certain questions, even the King had to yield. The towns availed themselves of the King's financial embarrassments to wring charters of privileges from the crown. Pedro IV., in the Fourteenth Century, first attempted to assert the power of the crown over the cities; but though he was partially successful, the task was not completed until after the union of Aragon with Castile. During this period Barcelona developed into one of the greatest Mediterranean ports, and entered into rivalry with the Italian cities, and especially with Genoa, against which continual wars were waged. By the marriage of Ferdinand of Aragon with Isabella, heiress to the crown of Castile, in 1469, the two States were united in 1479. The bond between the two, however, was only a personal one until 1516, when, on the accession of Charles I., they were definitely merged into a new Spain, with which the subsequent history of Aragon is identified.

ARAGONA, ä'rȧ-gō'nȧ. A city of Sicily, 77½ miles south of Palermo, and 7½ miles north of Girgenti. In its vicinity are rich sulphur mines, and the mud-volcano of Maccaluba, 135 feet high and 860 feet above the sea, which emits carbureted hydrogen gases. Pop., 1900, 11,985.

AR'AGONITE (named after Aragon, see below). An anhydrous calcium carbonate, identical with calcite (q.v.) in composition but differing from it by crystallizing in the orthorhombic system. Aragonite occurs in prismatic crystals, pseudo-hexagonal in shape. It is also found in radiated aggregates of needle-like forms. Further, stalactitic, incrusting, columnar, and coral-like forms occur, the last-named being known as *flos ferri*, from its occurrence in beds of iron ore. The prevailing color of aragonite is white, shading into violet, yellow, and pale-green in some varieties. Its lustre is vitreous. A silky, fibrous variety is known as *Satin spar*. Aragonite was first found in Aragon, Spain, whence its name. In the United States aragonite is found in several localities in California, Connecticut, Illinois, Missouri, New Mexico, Pennsylvania, and New York. The well-known varieties of Mexican onyx, largely used by architects for wainscoting and interior decoration are forms of aragonite.

ARAGUATA, ä′rȧ-gwä′tȧ (native name). The ursine howler. See HOWLER.

ARAGUAYÁ, ä′rȧ-gwȧ-yä′, or RIO GRANDE. A large river of Brazil, rising in the Serra Cayapo, in latitude 18° 10′ S., and longitude 51° 30′ W. (Map: Brazil, H 5). It flows northeasterly between the States of Goyaz and Matto Grosso, inclosing in its course the large Island of Bananal (q.v.). Near San Francisco, in latitude 5° 30′ S., the Araguayá joins the Tocantins, which empties into the Atlantic Ocean about 50 miles to the east of the main estuary of the Amazon. The Araguayá is more than 1300 miles long and navigable for more than half that distance. A line of small steamers plies its waters to the Rapids of Santa Maria.

ARAI HAKUSEKI, ä-rī′ hä′kōō-sä′kê (1657-1725). One of the most noted of modern Japanese scholars, Confucianists, and stylists, who, by his life and writings, illuminated and adorned the ideas that long molded Japanese society. When Iyeyasu "caused confusion to cease and order to prevail," native and Chinese learning revived in Japan, and a brilliant group of scholars in Yedo set forth the philosophical doctrines of Chu-Hi. Of these, Arai is best known. He became more liberal than his master, Seiga, but he was still orthodox, as against the Kogaku, or (in government view) "heretical" school of philosophy. As patronized by Iyeyasu and his successors, the Tycoons, from 1615 to 1868, this philosophical system became a sort of established church, and heretics were made to feel severe political opposition, which sometimes ended in imprisonment and death. Yet scattered over the country, the pupils of Arai and other masters instructed young gentlemen and helped powerfully to mold the public opinion by which the Mikado was restored to power in 1868. He wrote a book in three volumes, *Sei Yo Ri Bun*, or *Annals of the Western Ocean*, which was translated by S. R. Brown, in the *Transactions* of the North China Branch of the Asiatic Society (London, 1827-31).

ARAKAN, ä′rȧ-kän′, or ARACAN. The northern division of Lower Burma, British India, extending along the Bay of Bengal from about 18° to 21° 33′ northern latitude, and covering, with the adjacent islands, an area of 18,540 square miles. The surface is very mountainous in the interior, which is traversed by several parallel chains. There are vast forests and marshes covered with a thick growth of grasses and underbrush. The climate is exceedingly unhealthful. The lower parts of the country are well adapted to the cultivation of rice, indigo, pepper, and raw sugar, and many tropical fruits are found in a wild state. The chief articles of export are rice, salt, and teak-wood. The chief port is Akyab (q.v.). The town of Arakan, situated in the interior to the northwest of Akyab, which before the British conquest is said to have numbered nearly 100,000 souls, is now a place of ruins. The natives of Arakan are shorter and somewhat less round-headed than the Burmese proper, with whom they belong by race and language. A caste system with monogamy prevails among them. The population increased from 671,899 in 1891 to 760,848 in 1901. About seventy per cent. of the inhabitants are Buddhists, while the remainder is made up chiefly of Mohammedans. Arakan was formerly an independent kingdom. At the end of the Seventeenth Century it began to decline, owing to internal strifes, and a century later fell into the possession of Burma, from which it passed to Great Britain in 1826. Anthropological details concerning the peoples of Arakan will be found in Lewin, *Wild Races of Southeastern India* (London, 1870), and Risley, *Tribes and Castes of Bengal* (Calcutta, 1891).

ARAKTCHEYEFF, ä′rȧk-chā′yĕf, ALEXEI ANDREYEVITCH, Count (1769-1834). A Russian statesman. Of noble though poor family, he rose rapidly to high rank under the favoritism of Paul, who made him commandant of his bodyguard at Gatchina. On his accession to the throne, Paul made him commandant of Saint Petersburg, conferred upon him the baronial title, dismissed him in a short while, made him Count in 1799, and again retired him in eight months. After Paul's assassination, Araktcheyeff was kept near the person of Alexander I., became minister of war in 1806, and in the late years of that Emperor's reign was his all-powerful adviser in matters of internal policy. The will of the Emperor, whom he almost worshiped, was carried out at all hazards, and as the energetic Araktcheyeff did not stop short of any cruelty, his name became synonymous with terror to all liberal thinkers. In 1833 he deposited 50,000 rubles, of which three-quarters of the principal and accumulated interest is to be awarded in 1925 for the best history of Alexander's reign. It was provided that the remainder shall cover the expense of printing the work, to form a second prize, and to be paid for translations of the work into French and German. As he left no heirs and made no will, Nicholas I. granted his estate at Gruzino and all his possessions to the Novgorod Corps of Cadets, henceforth known as Araktcheyeff Corps, so as to perpetuate the memory of the statesman.

ARAL, ăr′*a*l (*Russian pron.* ȧ-räl′), or ARAL-DENGIS, LAKE. (For derivation see below.) A lake east of the Caspian Sea, within the limits of Russian Central Asia, between latitude 43° 43′ and 46° 45′ N., and traversed by the meridian of 60° E. longitude (Map: Asia, E. 4). It lies in the Aralo-Caspian lowlands, is bounded by the steppes and deserts of Khiva, by the land of the Kirghis, and by the plateau of Ust-Urt, separating it from the Caspian Sea. Its greatest length is about 230 miles; its greatest width is 182 miles; and its area, according to Strelbitski, is 25,050 square miles; this does not include its four large islands, occupying about 1000 square miles. After the Caspian Sea, it is the largest lake in the Eurasiatic continent, and, next to Lake Superior and the Victoria Nyanza, it is the fourth largest in the world. It lies at a height of 163 feet above the level of the ocean, and about 250 feet above that of the Caspian. Its numerous islands gave rise to its name of Aral-Dengis (Kirghiz, Turk. *aral*, island + *dengis*, sea, lake). The bluish tinge of its water suggested to the Russians the name of Blue Sea. In ancient times it was called the Lake of Oxiana, and during the Middle Ages the Sea of Khovaresm, or Khuarism. It is fed by the Syr-Darya (the ancient Jaxartes) on the east side and the Amu-Darya (or ancient Oxus) on the south. It is shallow, its average depth hardly reaching fifty feet. There are unmistakable signs of its drying up, especially in its southern part. The Aral is a salt-water lake, but it contains less salt than the ocean. It freezes at a considerable distance from the shore. It is very rich in fish, which are caught here in great quantities. It is remarkable that, of all the varieties of fish in the Aral, there is not a single salt-water variety. In the affluents of the Aral the Scaphirhynchus species of fish has recently been discovered, a variety not found anywhere else in the world at present, but which was abundant in the Tertiary period. Owing to the shallowness of its waters, navigation is difficult; but Russian steamers have been launched upon it, and took part in the operations against Khiva in June, 1873. The history of the Sea of Aral is very remarkable. Sir Henry Rawlinson and Colonel Yule collected references made to it in Greek, Latin, Arabic, and Persian writers, and tried to establish the fact that the area it now occupies has been dry land twice within historical times—the Jaxartes and the Oxus then running south of the Sea of Aral to the Caspian. It is very remarkable that the Amu (Oxus) has changed its bed very considerably within one decade, as is proven by a comparison of the maps carefully prepared in 1859 and 1870. See *Proceedings of Royal Geographical Society*, Vol. XI., Vol. XVI., and Vol. I. (new series, 1879); also *The Shores of Lake Aral*, by Major Wood (London, 1876).

ARA'LIA (derivation uncertain). A genus of plants, the type of the natural order *Araliaceæ*. These plants are dicotyledonous, and consist of trees, shrubs, and herbaceous plants, resembling the Umbelliferæ, both in their general habit and in their botanical characters, but differing essentially in the fruit, which is not formed of two separable carpels as in the Umbelliferæ. The fruit of the Araliaceæ consists of several one-seeded cells, and is often succulent. The order contains about four hundred known species, natives of tropical, temperate, and cold climates, generally possessing stimulant and aromatic properties. The principal genera are *Aralia*, *Panax*, *Hedera*, and *Fatsia*. Poisonous qualities are not developed as in the Umbelliferæ. The herbage of many species affords good food for cattle, and some are used for human food. The genus Aralia contains a considerable number of species—trees, shrubs, and herbaceous plants. It has a succulent fruit, with five or ten cells, crowned with the styles. *Aralia nudicaulis*, commonly called wild sarsaparilla, is a native of the United States. It is a species of low growth, having a solitary radical leaf with a trifid stalk and ovate serrated segments; the scape is shorter than the leaf. The root is said to be equal in value to sarsaparilla as an alterative and tonic. *Aralia racemosa*, well known as spikenard, has large, spicy, aromatic roots. *Aralia spinosa*, and *Aralia hispida*, also natives of North America, produce an aromatic gum-resin. Aralia spinosa is sometimes called toothache-tree; it also bears the name of angelica-tree. It is a native of moist woods in Virginia and Carolina, growing to a height of ten or twelve feet, with a single stem, spreading head, doubly and trebly pinnate leaves and ovate leaflets, and is very ornamental in a lawn. *Aralia polaris*, found in the southern island of New Zealand, and in the greatest abundance and luxuriance in the Auckland Islands, is a herbaceous perennial, four to five feet high, with large orbicular masses of green foliage and waxy flowers, which present a very striking appearance. *Aralia edulis*, now called *Aralia cordata*, is employed in China as a sudorific. Its shoots are very delicate and pleasant when boiled; and the roots, which have an agreeable aromatic flavor, are used by the Japanese as carrots or parsnips are by Europeans. Aralias abound in the warm valleys of the Himalaya. The natives collect the leaves of many as fodder for cattle, for which purpose they are of great value in a country where grass for pasture is scarce; but the use of this food gives a peculiar taste to the butter. Chinese rice-paper is cut from cylinders of the pith of *Aralia papyrifera*. Ginseng, the root of *Panax quinquefolia*, is one of the most important products of the order Araliaceæ. Large quantities of ginseng are collected and shipped to China, where wonderful medicinal qualities are attributed to it. For fine specimens almost fabulous prices are paid. Modern pharmacy does not consider it of great value. The astringent roots of *Gunnera scabra*, sometimes classed with the Aralias, are used in tanning, and its fleshy leaf-stalks are eaten like those of rhubarb. It has been seen on the sandstone cliffs of Chile with leaves nearly eight feet in diameter, each plant bearing four or five of these enormous leaves. It has been introduced into Great Britain, and is found to succeed well in the climate of Edinburgh. The only representative of this order in the British flora is the ivy (q.v.), *Hedera helix*. *Fatsia horrida*, a member of this family, is common along the Pacific coast, extending well into Alaska. It has slender, rope-like stems, crowned with large leaves. Stems and leaves are covered with prickles that sometimes make severe sores upon persons who come in violent contact with them. The popular name for the plant is Devil's Club.

FOSSIL FORMS. The genus Aralia and an allied genus, Araliæphyllum, have been described from many localities in the Cretaceous and Tertiary rocks of North America and Europe, where they are represented by about twenty-five species.

A'RAM, EUGENE (1704-1759). An English schoolmaster and scholar, born at Ramsgill, Netherdale, in Yorkshire. His father was a gardener, and could afford to keep Eugene at school for only a short time; but even while assisting his father the boy found time for study. He married early, and became a schoolmaster, first in Netherdale, and afterward at Knaresborough, where he continued to teach till 1745. At Knaresborough lived one Daniel Clarke, a shoemaker, and an intimate acquaintance of Aram. On one occasion Clarke happened to buy a quantity of valuable goods, which he easily obtained on credit; but, to the surprise of every-body, he soon after disappeared, and no trace of him could be discovered. Suspicion lighted upon Aram, not as Clarke's murderer, but as his confederate in fraud. His garden was searched, and in it were found some of the goods which Clarke had bought. Aram was arrested and tried, but acquitted for want of evidence. He now left his wife at Knaresborough, and went to London and other parts of England, teaching here and there; and, in spite of his roaming life, contrived to acquire a knowledge of botany, heraldry, Chaldee, Arabic, Welsh, and Irish, and was planning a comparative dictionary of all the European languages. His most important scholastic achievement was his discovery of the similarity of the Celtic to other European languages. He was at work on his dictionary when he was suddenly dragged away from his ushership of Lynn Academy, in Norfolk, and committed to prison on a charge of murder. The remainder of the story is well known. In 1759 a skeleton was dug up near Knaresborough, which the inhabitants suspected to be that of Clarke; for they had now come to the conclusion that the unfortunate man had met with foul play, especially as Aram's wife had, on several occasions, made strange statements to the effect that her husband and a man named Houseman knew more of Clarke's disappearance than they chose to tell. Houseman was now confronted with a bone of the skeleton which had been discovered. He very emphatically denied that it was Clarke's. People naturally wondered how he could be so positive, and they became convinced that if the skeleton was not Clarke's, Houseman must know where Clarke's body was. At last he confessed that he had been a spectator of the murder of Clarke by Aram and one Terry. He named the place where the body had been hidden. The skeleton was dug up, and Aram was tried at York for the murder of Clarke, on August 3, 1759. He conducted his own defense, and attacked, with great acumen, the doctrine of circumstantial evidence; but to no effect, for a verdict of guilty was returned, and he was condemned to be executed within three days. In the interval he confessed his guilt to two clergymen. While in the condemned cell he wrote a defense of suicide, but failed in a practical illustration of the doctrine. For further details consult: N. Scatcherd, *Memoirs of Eugene Aram* (London, 1838), and for an idealized portrait, Bulwer, *Eugene Aram* (London, 1832); Hood, *The Dream of Eugene Aram* (London, 1845).

AR'AMA'IC. The name given to a branch of the Semitic languages, which embraces numerous subdivisions. According to the classification now generally adopted, Semitic speech is divided into four broad divisions, as follows: (1) Babylonian-Assyrian; (2) Aramaic; (3) Hebræo-Phœnician; (4) South Semitic. Passing over the early Aramaic inscriptions, these languages may be divided into a Western and an Eastern branch. To the former belong (a) Biblical Aramaic; (b) Palmyrene; (c) Nabatæan; (d) Jewish Aramaic in certain Targumim and the Palestinian Talmud; (e) Christian-Palestinian; (f) Samaritan; (g) Modern dialects in the Lebanon. Eastern Aramaic are: (a) much of the Babylonian Talmud; (b) Mandæan; (c) Syriac; (d) Neo-Syriac in Northern Mesopotamia, Kurdistan, and the neighborhood of Lake Urmi. Of these the most interesting and important, so far as literary productions are concerned, are Biblical Aramaic, Babylonian Aramaic, and Syriac. Examples of Biblical Aramaic are in the Books of Daniel (c.165 B.C.) and Ezra (c.250 B.C.), with some scattered words elsewhere in the Old Testament. The discussions of the Babylonian rabbis on the Pentateuchal and post-biblical laws are almost exclusively in the Aramaic dialect, which was adopted by the Jews on coming to Babylonia, and which forms the language of the most of the vast compilation known as the Babylonian Talmud. (See TALMUD.) Roughly speaking, this compilation covers the four centuries from A.D. 200 to 600, though there are both earlier and later portions in it. The Syriac literature is almost exclusively Christian, and for the greater part theological. Its dialect is more properly that of Edessa, for through the translation of the Bible known as the Peshito (i.e. the plain or unadorned rendering), in the Second Century A.D., the literary language of Edessa spread throughout Mesopotamia and Palestinian Christendom. From this time until the Fourteenth Century a large literature was produced, embracing not only doctrinal and homiletic expositions, rituals, and religious poetry, but also history and romance. Even after the Arabic conquest, Syriac continued for some centuries to be the current language in Mesopotamia and northern Palestine. See SYRIAC.

Of the other Aramaic languages, the Palestinian Aramaic is represented chiefly in the literary remains of the Aramaic-speaking Christians of Palestine and the discussions of the Rabbis in the Palestinian schools on the minute regulations of post-exilic Judaism, while the Samaritan is of importance chiefly because of the translation of the Pentateuch into this speech. The Mandaic, one of the Christian dialects of Mesopotamia, has but scanty literary remains, and is of importance chiefly for the insight it affords into the peculiarities of the Mandæan sect. Palmyrene and Nabatæan are represented chiefly by mortuary and commemorative inscriptions, belonging to the early centuries of our era, while the modern dialects have now a large literature—Bible translations, Sunday-school books, and religious works—due to the efforts of various missionary societies. A feature of the Aramaic speech, which is illustrated by the above sketch, is the large geographical extent occupied by it, covering as it does practically the entire range of Semitic settlements, with the exception of Southern Arabia and Abyssinia. As early as the Eighth Century B.C. we find Aramaic a current speech in the extreme north of Syria at the foot of the Taurus range. Monuments of rulers in this district, found by German explorers at Senjerli, contain inscriptions in Aramaic. The southern limit of Aramaic is marked by inscriptions found at Teima in northern Arabia, and belonging to the period before Mohammed. In the later days of the Babylonian Empire, Aramaic even superseded the native Babylonian as the current speech of the people, so that the Hebrews, upon coming to Babylonia, adopted Aramaic and not Babylonian, in place of Hebrew. In Palestine proper, Aramaic also crept in at a comparatively early period. After the return of the Hebrews from the Babylonian exile, Hebrew rapidly declined and assumed the character of a sacred and learned language in contrast to the ever-growing popularity of Aramaic as the speech of the people. For the special traits of Aramaic, see Semitic Languages.

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AR′AME′ANS. By Arameans, or Syro-Chaldeans, Keane (1896) denotes certain Semitic peoples of Syria, parts of Palestine, and the Lower Euphrates, while Brinton (1890) makes Aramean a subdivision of the more general Chaldean, and Featherman (1881) uses it to include all the Semitic, Hamitic, and related peoples. As Arameans we may reckon the ancient Babylonians (in so far as they were Semites), the Assyrians, the Syrians, or Western Arameans; the so-called Chaldeans, or Eastern Arameans, and the Samaritans (in part), besides some peoples of less importance. As a result of the vitality of Arabic, and the absorbing power of the people who carried it north, the Eastern Aramaic is now reduced to the dialects of a few communities in Northern Mesopotamia, Kurdistan, and around Lake Urmi. The Western Aramaic is of interest, as it was probably the every-day speech of Palestine in the time of Jesus, and used by him as the quotations in the New Testament show. Aramaic became the language of general intercourse in later Babylonian and Assyrian times, and seems to have driven the Semitic dialects of that region out of popular use. See Syriac Language; Semites.

AR′AMIN′TA. A favorite name among the Restoration dramatists, although never given by them to very prepossessing characters. Vanbrugh, in *The Confederacy*, christens with it the wife of Moneytrap, a snobbish creature with a weakness for titles, and Congreve gives it to the principal female character in his comedy of *The Old Bachelor*.

ARAMIS, à′rà′mēs′. The least sympathetic of Dumas's *Three Musketeers*, and the one never really loved by the author. His valor and resource were marred by his insincerity. He attains high Church honors, finally becoming the head of the Jesuits.

ARAN, ăr′an, South Isles of. Three small islands situated at the entrance to Galway Bay, off the western coast of Ireland. The principal and the most western of them is called Inishmore, and is seven miles long, and two miles broad. The next is called Inishmaan, and the third, lying to the southeast, Inishere. Their total area is about eighteen square miles, and they all form the barony of Gore. The soil is for the most part sandy, and the only remarkable feature of the islands is the number of old relics found on them. The islands contained at one time about twenty churches and monasteries. There exist some remains of old fortresses, supposed to have been built in the First Century A.D. The main industry is fishing, and the principal village is Kilronan, on Inishmore, with a population of 750.

ARANDA, à-răn′dȧ, Don Pedro Pablo Abaraca de Bolea, Count of (1718-99). A Spanish statesman, born in Saragossa, of a distinguished Aragonese family. He at first followed a military career, and rose to the rank of general. In 1760 he was appointed by Charles III. ambassador to the court of Augustus III., King of Poland. In 1766 he was recalled to Madrid on account of its disturbed state, and became president of the Council of Castile and prime minister. He soon restored order in the capital, expelled the Jesuits from Spain, suppressed the banditti in the Sierra Morena, and promoted a liberal policy. In 1773 he was removed from his post through the influence of the clergy, and sent as ambassador to France, where he remained until 1787. In 1792 he was again made prime minister, but was soon deposed again through the agency of Godoy, Duke of Alcudia, the Queen's favorite. He remained president of the Council of State, which he had organized; but upon opposing the foreign policy of Godoy he was banished to Aragon, where he died.

AR′ANE′IDA. An order of Arachnida. See Spiders.

ARANGO Y PARREÑO, à-răn′gō ē pȧ-rā′nyō, Francisco de (1765-1837). A Cuban statesman. He was born at Havana, was admitted to the bar in 1789, and twice represented Cuba in the Cortes of Spain. It was through his exertions that the tobacco monopoly was done away with, and the ports of Cuba were opened to foreign trade. He is best known for his works treating of Cuban economies, many of which have been translated into other languages.

ARANJUEZ, ä′rȧn-ʜwĕth′ (From Lat. *Ara Jovis*, altar of Jupiter). A town in the Province of Madrid, Spain, situated on the left bank of the Tagus, 28 miles south-southeast of Madrid, in a beautifully wooded valley (Map: Spain, D 3). The town is built in the Dutch style and has broad and regular streets intersecting each other at right angles. It is famed for its palace and gardens. The place owes its existence to an idiosyncrasy of Philip II. He erected a splendid palace where had been but a shooting villa, and for several months of the year Aranjuez became the seat of government. The place naturally acquired more or less importance from this circumstance, its population at one time reaching 20,000. The various sovereigns who occupied Aranjuez beautified it by erecting new structures or extending the gardens. Aranjuez is known historically for the treaty of alliance concluded here between France and Spain on April 12, 1772, and as the scene of the abdication of Charles IV. on March 19, 1808. Pop., 1900, 12,670.

ARANSAS, à-răn′*zas*, Bay. An inlet of the Gulf of Mexico, on the coast of Texas, about 15 miles northeast of Corpus Christi Bay (Map: Texas, F 6). It has a length of about 18 miles, and its greatest width is about 8 miles. It is connected with the Gulf by a narrow channel, known as Aransas Pass. It has a sandy bar, which detracts from its commercial importance, and is protected by a lighthouse. On November

20, 1864, the pass was the scene of a battle between the Confederate and the Federal troops, which resulted in the capture of the former's fortifications at the pass.

ARANSAS PASS. See Aransas Bay.

ARANY, ŏ′rŏ-ny′, János (1817-82). Next to Petöfi the greatest of modern Hungarian poets. He was born at Nagy-Szalonta, March 1, 1817. His parents were simple peasants and very poor, but he was their only son and the child of their old age, and they spared no effort to give him an education. At four he had already learned to read from letters traced in the ashes on the hearth, and the Psalms were his first spelling-book. From the first he was an indefatigable reader, and had soon exhausted the resources of the local library, both in Hungarian and in Latin. At the age of fifteen he entered the college at Debreczin, where he quickly distinguished himself, but his dreams were of a romantic career. Like Petöfi, he had felt the fascination of the stage, and in 1836 joined a company of strolling players; but after a few months, poverty and hunger brought him, footsore and discouraged, back to his father's house. Here he put aside romantic aspirations, and having obtained an appointment as notary, settled down to be a mere "every-day" man. It was not until the summer of 1845 that certain absurdities in the life of the county officials "awoke the voice of satire within him," and inspired his first poem, a satirical epic, *Az elveszett alkotmány* ("The Lost Constitution"), and the Kisfaludy Society of Pesth having offered a prize for the best humorous poem, he submitted it and was successful. Two years later he obtained a second prize with the first part of his great trilogy, *Toldi,* an epic founded wholly upon Magyar traditions, which immediately brought him into widespread popularity, and won him the friendship of the leading men of letters of his day and country. Petöfi, among others, wrote to him, saying: "While others win their laurels leaf by leaf, we must grant you at once the full crown." Arany's popularity soon extended to the lowest ranks of the people, for he had saturated himself in childhood with the folklore of his race, and he excelled above all in the art of weaving these old legends and traditions into the fabric of his poems, and in appealing to that spirit of national pride which is a leading characteristic of the Magyar race. From this time on his career was determined. In 1860 he removed to Pesth, becoming first director and then secretary of the Kisfaludy Society, and in 1870 general secretary of the Hungarian Academy of Science, a position which he held until shortly before his death, October 22, 1882. A monument was raised to his memory at Pesth in 1893. Among his more notable works should be mentioned: *Murány ostroma* ("The Siege of Murány"); *King Buda's Death,* an epic in twelve cantos; the second and third parts of the *Toldi* cycle, *Toldi's Love* and *Toldi's Evening;* some exquisite ballads, which many Hungarian critics think have been unsurpassed, and numerous translations, including Aristophanes, and portions of Goethe, Tasso, and Shakespeare. Arany's own estimate of his worth is interesting: "My talent," he wrote, "is always urging me onward, but my lack of energy constantly drags me back; and so I remain, like the greater part of my work —a fragment!" This verdict falls far below that of his countrymen, who unite in regarding him as the poet who raised Hungarian poetry to a hitherto unknown height, as unequaled in his versatility and artistic finish, and in his power of combining the spirit of the primitive Magyar folksong and the classic polish of his own verse in perfect harmony. There are numerous German translations of his poems, among others, Kertbeny (Leipzig, 1851); L. Kórodi (Kronstadt, 1863); Sponer (Leipzig, 1880); and Dux (Pesth, 1861).

ARAP′AHO (probably, tattooed people). An important Algonkian tribe of the North American plains, living in three principal divisions, viz., the Hitunena, "Beggars" or Grosventres, associated with the Assiniboin in northern Montana (600); the Northern Arapahos, living with the Shoshonis upon a reservation in Wyoming (800); and the Southern Arapahos, associated with the Cheyennes in Oklahoma (980). These last, together with the Cheyennes, sold their reservation by treaty in 1892, and are now citizens, holding allotments in severalty. In character the Arapahos are friendly and accommodating, and display a superior adaptability to civilization. They are also of a fervent religious spirit, and were among the principal adherents and propagators of the ghost dance religion some ten years ago. In the early border wars they were usually friendly or neutral, notwithstanding the fact that their allies, the Cheyennes, were among the most determined of the hostiles. See Kroeber, *The Arapaho* (New York, 1904).

ARAPAIMA, ä′rȧ-pī′mȧ (probably native name). A genus of South American river fishes, closely related to the herrings, and having the body covered with a mosaic of strong, bony, compound scales. They are the largest fresh-water fishes in the world, attaining a length of 15 feet and a weight of 400 pounds. They are much valued as food, both in the fresh and in the salted condition, by the people of Brazil and Guiana. The principal species is *Arapaima gigas,* which is taken by spearing.

ARAPILES, ä′rȧ-pē′lâs. A village of Spain in the Province of Salamanca, situated about four miles southeast of the town of Salamanca (Map: Spain, C 2). It was famous as the place of the battle of Salamanca, in which the French forces under Marmont were defeated by the allied troops under Wellington, on July 22, 1812.

AR′ARAT (*Airarat,* in the old Armenian dialect *Aiarat,* i.e. the plains of the Aryans). The ancient name of the fertile plateau through which flows the river Aras, or Araxes. Ararat appears in the Old Testament (II. Kings xix. 37) as the place to which the sons of Sennacherib fled after murdering their father. In Assyrian texts the country is also mentioned frequently from the Ninth Century B.C. onward under the form Urarti, though it would appear that the name was used somewhat indefinitely for a larger district than the Ararat of classical writers. It was the ambition of the Assyrian kings to include Urarti in their dominions, and frequent military expeditions were made against *Nairi,* as the vast tract to the north and northeast of Assyria was commonly termed. It occupies the centre of the mountainous region of Armenia, belonging partly to Turkey and partly to Russia. According to Genesis (viii. 4) it was on the "mountains of Ararat" that Noah's Ark rested after the Deluge, from which it appears that Ararat was properly the designation of an entire district. Such, however, was the general interest attaching to the Biblical tradition, that the name Ararat became attached to a particular mountain, the one called by the Armenians *Masis Leusar*, or "mountains of the ark"; by the Turks *Aghri-Dagh*, "steep mountain"; and by the Persians, *Koh-i-Nüh*, "Noah's mountain." It rises in two volcanic cones, known as the greater and lesser Ararat; the former, which attains the height of 16,912 feet (according to another measurement, 17,212 feet) above the level of the sea, is covered with perpetual snow. It is, next to Mount Demavend, the highest elevation of Western Asia, and since 1827 it forms the point where the Russian, Turkish, and Persian territories meet, its summit being in Russian territory. In 1840 the form of the mountain was partially changed by a frightful and destructive earthquake. Previous to this period, at the base of the mountain and at a point where a stream runs from a wild gorge, there stood the village of Arguri, or Aguri. It was surrounded by gardens and orchards, and had upwards of one thousand inhabitants. In the ravine, 2300 feet above the village, stood the Armenian convent of St. James, and 1000 feet higher still a chapel dedicated to St. James. The beauty and mild air of the district made Arguri a favorite summer resort of the richer inhabitants of Armenia. It was destined to undergo a great change, however. On July 2, 1840, dreadful shocks of earthquake were felt. Great masses of the mountain were thrown into the plain, the ravine was closed, the convent and chapel disappeared, and the village and the gardens which surrounded it were buried under rocks, earth, and ice, with all the inhabitants.

ARARAT, or **PI'LOT MOUN'TAIN**. A mountain about 3000 feet high, situated in Surry County, N. C.

ARARI, à-rä'rê, SERRA. A low mountain chain forming the southwestern boundary of the States of Ceará and Piauhy, Brazil (Map: Brazil, J 5). It forms part of the mountain system that extends southward from the northeast coast at a point just to the west of the mouth of the Parahiba River. It is, besides, the watershed between that river system and the São Francisco, to the eastward.

ARAS, à-räs' (the ancient Gk. 'Αράξης, *Araxēs*). A river in Armenia, formed by the junction of the Bingol-Su and the Kaleh-Su, and uniting its waters with those of the Kur (ancient *Cyrus*), after a course of about 500 miles. The main stream is the Bingol-Su, which rises in the Bingol-Dagh Mountains, Asiatic Turkey, in latitude 41° 30' N. and longitude 41° 10' E.; and flowing north-northeast, is joined a little below Hasan-Kaleh by the Kaleh-Su, after which the combined stream is called the Aras (Map: Turkey in Asia, M 3). About 52 miles west of Kazyman it crosses the Russian frontier, traverses the territory of Kars and the government of Erivan; then forms for a long distance the boundary line between Russia and Persia, and by a sharp turn south it flows on until it meets the Kur. On its banks are found many traces of ancient canals and other proofs that the surrounding country was once densely populated. The ancient writers claimed that the Aras flowed directly into the Caspian Sea, and modern research has proven this to have been the case. Near the village of Janfitze the old bed of the Aras is visible for about twenty miles. This former bed of the river passed through Armavir, the ancient capital of Armenia.

ARA'TOR. A Christian Latin poet of the Sixth Century. He was born in Liguria, studied at Milan, became a jurist under Theodoric, and was an official under Athalaric, Theodoric's successor. About 540 he took orders as a subdeacon of the Roman Church. He is best known for his *De Actis Apostolorum*, a poem in very creditable hexameters, but much overweighted with reflective and allegorical passages. He also wrote an *Epistola ad Parthenium* in the elegiac distich.

ARA'TUS (Gk. Ἄρατος, *Aratos*) (B.C. 271-213). A distinguished statesman and general of Sicyon. At the time of Aratus's youth, Sicyon was in the hands of tyrants, who were chiefly partisans of the Macedonian kings. Clinias, the father of Aratus, was an active supporter of the opposite side, and, in the course of a party struggle, he was assassinated, B.C. 264. Many members of his party were obliged to flee from the city, and Aratus was rescued by a relative and taken to Argos. Here he spent his youth and became a recognized leader of the exiled band. In his twentieth year (B.C. 251), putting himself at the head of a few followers, he made his way to Sicyon, secretly entered the town, drove out the tyrant, and reëstablished a government of the people. Owing to the long rule of the tyrants, he at first met with many difficulties in his efforts at reorganization, but he successfully overcame these, and was recognized as the first man in the state. Under his lead, Sicyon joined the Achæan League, in which it soon rose to a position of first importance. In B.C. 245 he was made general of the League, an office which he held in the course of his career seventeen times. Through his influence, many other Greek cities joined the confederacy. In B.C. 224 the League was hard pressed by the Spartans under Cleomenes, and Aratus found himself obliged to join hands with Antigonus, King of Macedonia. An alliance was made, and the Spartans were defeated at Sellasia, in B.C. 221; but through this step the Macedonians gained a foothold in Peloponnesus. Aratus was a greater statesman than general, but he was sincere throughout his life in his efforts to enlarge and strengthen the league. He was finally poisoned, in B.C. 213, by order of Philip, the successor of Antigonus. Two annual festivals (the Aratea) were instituted by his countrymen in his honor. Near the end of his life he wrote his memoirs, in thirty books. Consult Müller, *Fragmenta Historicorum Græcorum* (Paris, 1868-74).

ARATUS OF SOLI. A Greek physician and poet of Cilicia. About B.C. 270, at the request of the Macedonian king, Antigonus Gonatas, he wrote a Greek didactic poem, entitled, *Phænomena*, founded on the astronomical system of Eudoxus of Cnidos, and appended to it another poem, *Diosemeia*, giving rules for prognostication of the weather. A pure style and correct versification mark both poems, which were translated into Latin by Cicero, Cæsar Germanicus, and Rufus Festus Avienus. Aratus was a native of the same province as St. Paul, who quotes from him in his speech on Mars' Hill (Acts xvii. 28). Critical edition by Maass (Berlin, 1892).

ARAUCANIA, ä′rou-kä′nê-ȧ. The country of the Araucos or Araucanian Indians, a territory in the southern part of Chile, occupying a large portion of the province of Arauco. The country is divided from north to south into four parallel regions, which were formerly administered by hereditary *toguis*. The population cannot be given with accuracy, but is estimated at 50,000. In physical type they resemble their kindred of the pampas. Their language is of such harmonious and adaptable character that a serious attempt was once made by a missionary student to introduce it into Europe to supersede Latin. The Araucanians remained independent longer than any other native tribe on the American continent, and had fought for their liberty, with intervals of precarious truce, from 1537 to 1773. During the war between Spain and the Chilean colonists, Araucania remained neutral. In 1861, a French adventurer named Antoine Tounens was elected King of Araucania, under the name of Orélie Antoine I., but was deposed and sent back to France by the Chilean Government. The rule of Chile was recognized by the Araucanians in 1870. Consult A. Polakowsky, "Die heutigen Aurakanen," in *Globus*, No. 74 (Brunswick, 1898).

ARAU′CAN STOCK. A group of South American tribes formerly occupying the pampas region of Argentina, from about 35° south to the Rio Negro and the adjoining portion of Chile, including the island of Chiloe. The stock name (*Aucanian* of Brinton) is derived from *aucani*, "wild, indomitable." In their general character and habit the Indians of this stock closely resemble our own plains tribes; or rather, perhaps, the Navajos, most of them wandering constantly from place to place in quest of fresher pasture for their herds of horses, cattle, and sheep, dwelling in low skin tents and subsisting almost entirely upon meat, despising agriculture, but expert in dressing skins, forging lance blades and knives, and weaving the wool of their sheep into blankets and ponchos. They seem to have but a loose organization, many of the tribal names being merely direction names. As a race they are warlike and independent, refusing civilization or Christianity. Among their tribes are the Araucano, Chono, Huilche, Moluche, Puelche, Ranquele, and others.

AR′AUCA′RIA (from *Araucania*, a territory in the south of Chile). A genus of plants of the natural order Coniferæ or pines, consisting of lofty trees, natives of South America and Australasia. The species, of which there are fifteen, are all evergreen. The leaves are broader than those of pines and firs, which, however, the trees resemble in their general manner of growth. *Araucaria imbricata*, sometimes called the Chile Pine, a native of the Andes of Chile, forming forests on their western declivities, attains a height of 150 feet. Its trunk is quite straight and free from knots. The bark of the young trees is studded with leaves from the base upward, even until the tree is 12 or 15 years of age. The branches are in whorls of five to eight. Young trees have branches almost from the ground; old trees have tall naked stems, with a crown of branches. The female strobile (cone) is roundish ovate, six to eight inches in diameter, with scales terminated by a long awl-shaped point, and seeds wedge-shaped and more than an inch in length. The outer and inner bark of full-grown trees are each four to six inches in thickness. From both outer and inner bark, and indeed from all parts of the tree, resin flows readily and in great abundance. The leaves are lanceolate, about an inch in length, and half an inch in breadth near the base, sharp-pointed. The timber is heavy, solid, hard, fibrous, yellowish white, and beautifully veined. It is suitable for masts of ships. The resin, which is white, has a smell like frankincense, and a not unpleasant taste. The seed is pleasant to the taste, not unlike the chestnut, and is a most important article of food among the natives. It is eaten raw, boiled, or roasted. A spirituous liquor is distilled from it. A single strobile sometimes contains between 200 and 300 seeds, and one tree may be seen loaded with 20 or 30 of these great strobiles. This Araucaria was introduced into Great Britain at the end of the Eighteenth Century, and is now pretty frequently planted. *Araucaria Brasiliana*, the Brazil Pine, has loosely imbricated lanceolate leaves, and a looser and more spreading habit than Araucaria imbricata. The seeds or nuts are sold as an article of food in Rio Janeiro. The resin which exudes from the tree is mixed with wax to make candles. *Araucaria excelsa*, the Norfolk Island Pine, a native of Norfolk Island, New Caledonia, etc., attains a height of 160 to 220 feet, free from branches to 80 to 100 feet, with a trunk sometimes 11 feet in diameter. The wood is white, tough, close-grained, and so heavy as almost to sink in water. The leaves of the young trees are linear and spreading; those of the adult are ovate, and closely imbricated. The cones are four to five inches in diameter. *Araucaria Cunninghamii*, nearly globular, the Moreton Bay Pine, a native of the shores of Moreton Bay and banks of the Brisbane River in New South Wales, very much resembles the last. It attains a height of 150 to 200 feet, and a diameter of three to six feet. The leaves of the adult trees are lanceolate and imbricated. The wood is yellowish, and is used for boat-building, house-carpentry, and the common kinds of furniture. *Araucaria Bidwillii*, the Bunya Bunya, is an important tree of Queensland, where it attains a height of 100 to 150 feet and a diameter of three to four feet. The timber is not quite so valuable as that of the Moreton Bay Pine. The seeds, of which there is said to be an abundance every three years, are as much as two inches long and three-quarters of an inch broad, and are much used for food by the aborigines. An important resin is obtained from this tree.

There are a number of species and varieties grown in greenhouses in the United States, where they are prized for their graceful appearance. This is especially true of Araucaria excelsa. The species do not flourish in the open, except in the southern States. Nearly all the leading species are successfully grown as ornamentals in California.

FOSSIL FORMS. Araucaria, and several allied genera, have been found abundantly in rocks of Mesozoic and Tertiary ages in nearly all parts of the world. The oldest representative of the group is the genus *Walchia*, which occurs in rocks of Permian or uppermost Carboniferous Age, and which grew to a great size, equaling that of the tallest spruces of modern times. Throughout Mesozoic rocks of America, Europe, and Asia, the genus Araucaria and its allies have been widely recognized by their leaves, branches, fruits, and in some cases by even large trunks. The type genus Araucaria appears first in rocks of Lower Jurassic Age; it reached a considerable degree of expansion in Cretaceous time all over northern Europe and Greenland, and at the end of the Eocene Tertiary it became extinct over that region, probably because of climatic changes which forced it to migrate farther to the southward. It will hence be seen that the modern representatives of this genus are mere relics of a once extensive group of plants which in those earlier times furnished the great forest trees that covered a large part of Europe and Asia, and to a lesser degree portions also of the American continent.

Consult: F. von Mueller, *Select Extra-Tropical Plants Readily Eligible for Industrial Culture* (Melbourne, 1895); G. Bentham, *Flora Australiensis* (London, 1863-78); G. Nicholson, *Illustrated Dictionary of Gardening* (London, 1888); L. H. Bailey, *Cyclopædia of American Horticulture* (New York, 1900-01). See also article CONIFERÆ.

ARAUCO, ȧ-rou'kô. A province of Chile, bounded by the provinces of Concepción, Bio-Bio, Malleco, and Cantin, and the Pacific Ocean (Map: Chile, C 11). Its area is 2457 square miles. It has a fertile soil and contains some minerals. Formerly the province occupied a far larger area. The population in 1903 was 71,435. Capital, Lebu, with a population of 3295. See ARAUCANIA.

ARAUJO DE AZEVEDO, ȧ-rou'zhô dȧ ä'-sȧ-vä'dô, ANTONIO DE (Conde da Barca) (1754-1817). A Portuguese statesman and diplomatist, born at Sa, near Ponte de Lima. In 1789 he was appointed ambassador to The Hague. In 1797 he negotiated at Paris a treaty with France, but it was rejected by the Directory. A few months later he went as ambassador to Berlin. After the Peace of Amiens he served as ambassador to Saint Petersburg. In 1803 he was recalled to Lisbon, to assume the office of minister of foreign affairs. As head of the State he did much for its material advancement; but with the capture of Lisbon by Napoleon and the dethronement of the royal family in 1807, he accompanied the court to Brazil. During the first years of his residence in the New World, he devoted himself to scientific and literary pursuits. He founded at Rio de Janeiro a school of fine arts and one of medicine and chemistry. He introduced the cultivation of tea, and in many ways encouraged agriculture and industries. In 1814 he was minister of marine for the colonies of Brazil, and the next year received the title of the Count of Barca. At his death he was minister of foreign affairs. Among his literary works were two tragedies, and translations from Horace, Gray, and Dryden. He died in Rio de Janeiro.

ARAUJO PORTO-ALEGRE, pôr'tô ȧ-lā'-grȧ, MANOEL DE (1806-79). A Brazilian architect and poet. He was born at Rio Pardo, in the Province of São Pedro, studied art at Rio de Janeiro, and art and architecture in Paris and Italy, and in 1837 was appointed professor in the Academy of Art at Rio de Janeiro. He was appointed consul-general at Stettin in 1859. He designed the church of Santa Ana and the Rio Bank, wrote a number of moderately successful comedies, *Colombo* (an uncompleted epic), and a volume of poems entitled *Brasilianas* (1863).

ARAUNA, ä'rȧ-o͞o'nȧ. A South American tribe of Tacanan stock, living along the Madre de Dios, a northern tributary of the Benī River, on the Peru-Bolivia frontier. Although evidently of considerable importance, contemporary accounts concerning them differ radically, Heath (1883) asserting that they are naked cannibals, ugly and ill-formed, while Labre (1885) describes them as sedentary agriculturists, and Armentia (1887) says that they are gentle and friendly, and of remarkably light complexion. According to Labre also, they have temples with images of wood and polished stone, and hold women so impure as to exclude them from religious rites, and not even to permit them to know the names of the gods.

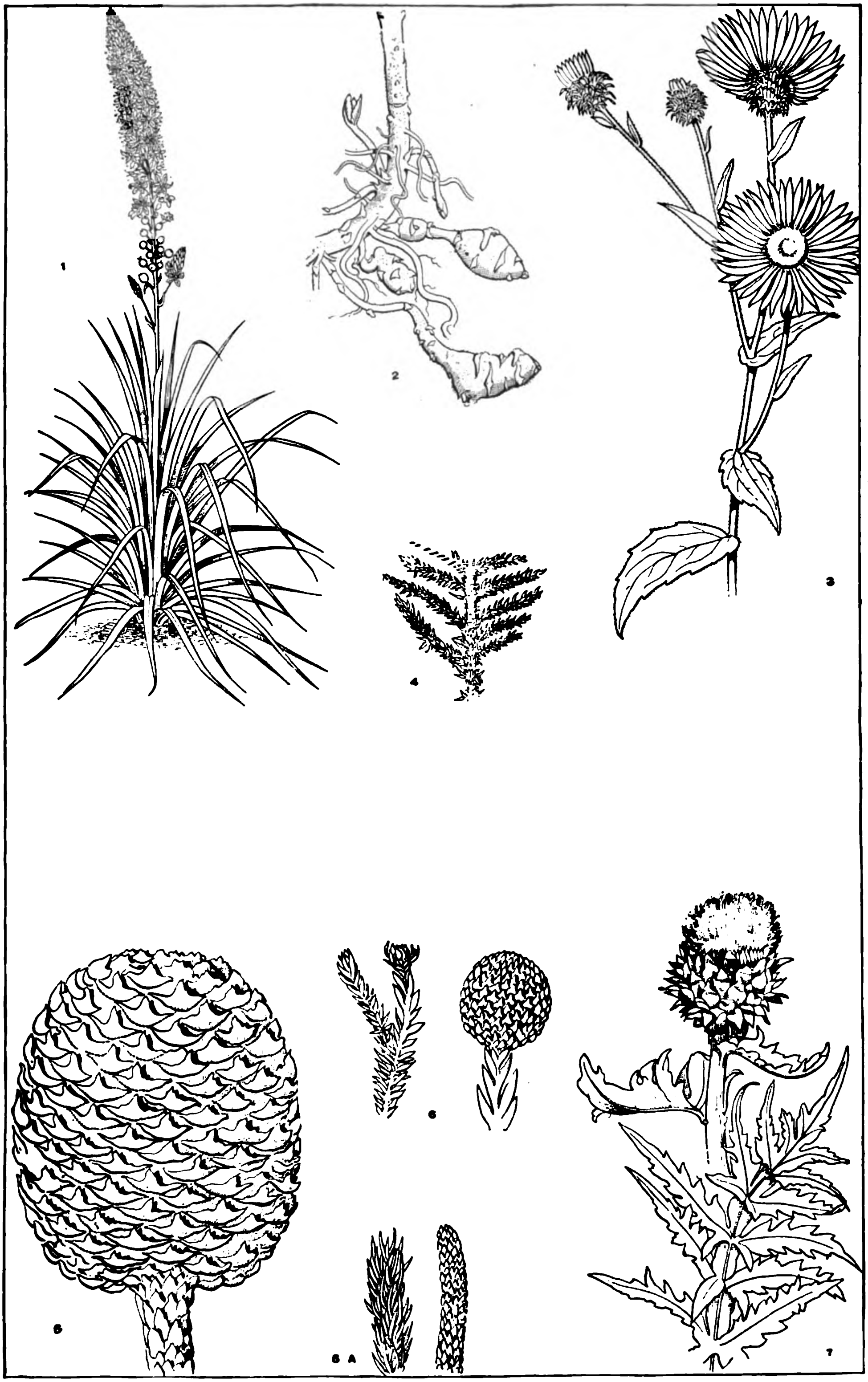
ARAURE, ȧ-rou'rȧ. A town in the State of Lara, Venezuela, on the Acarigua River, twenty miles south of Barquisimeto (Map: Venezuela, D 2). The surrounding region is noted for its fertility in the production of cotton, coffee, and cattle, while near by is the scene of the battle of Arame, December 4, 1813. Population, 4000.

ARAVULLI, ăr'ȧ-vŭl'lē. A mountain range in Rajputana, British India, extending from about latitude 22° 40′ N., longitude 74° E., to latitude 26° 50′ N., longitude 75° E. (Map: India, B 3). It is about 300 miles long, with a width ranging from 6 to 60 miles. The river system of the Aravulli Mountains is very extensive, especially on the northern and southern slopes. The vegetation is very poor, and the valleys inclosed between the hills are mostly sandy and utterly devoid of vegetation.

ARAWAK, ä'rȧ-wäk. A tribe living on the Corentyn River in Dutch Guiana, from which the great Arawakan stock (q.v.) derives its name. The word signifies "meal eaters," in allusion to cassava bread, which forms a principal article of diet with the tribe. The Arawak cultivate both cassava and corn, but depend largely also on hunting and fishing. They have the clan system, with descent in the female line, and practice the couvade.

ARAWAKAN, ä'rȧ-wä'kan, **STOCK.** The most widely extended linguistic stock of South America, its tribes formerly reaching, with interruptions, from southern Brazil and Bolivia to the northernmost extremity of the continent, and including also, until the irruption of the Caribs, the whole of the West Indies, several villages being even established upon the mainland of Florida. Columbus made his first landing and earliest discoveries in Arawakan territory, and the names preserved from Haiti, Cuba, and the Bahamas are readily explained from the existing dialects of this stock. The Arawakan tribes were pressed upon by the Caribs from the lower Orinoco, and these fierce invaders had already seized many of the southern Antilles at the time of the discovery, the occupation being then so recent that the women of the island Caribs, most of whom were Arawak captives, still spoke that language. Physically, the Arawakan tribes are rather undersized, with apparently low vitality. Their plane of culture is

ARAUCARIA



1. ASPHODEL (Asphodelus albus).
2. JERUSALEM ARTICHOKE (Helianthus tuberosus), showing tubers.
3. A WESTERN ASTER (Aster townsendii).
4. A FOSSIL SPECIES OF NORFOLK PINE (Araucaria).
5. NORFOLK PINE (Araucaria excelsa).
5A. TIPS OF BRANCHES OF NORFOLK PINE.
6. CONE AND BRANCH OF A FOSSIL ARAUCARIA.
7. GLOBE ARTICHOKE (Cynara scolymus).

rather above that of their neighbors. Those of the islands cultivated corn, manioc, and cotton, as well as tobacco, which came first to European knowledge through them. They were skillful weavers and artisans in wood, stone, and native gold. Considerable study has been made of the mythologies of the stock. Of perhaps a hundred existing Arawakan tribes, the most important are the Anti, Arawak, Barre, Baure, Goajiro, Guana, Juri, Manaos, Maneteneri, Maipure, Maranha, Moxo, Passé, Piro, Taruma.

ARAX'ES. See Aras.

ARAYAT, ä-rī'ät. A town of Luzon, Philippines, in the Province of Pampanga, about twelve miles northeast of Bacolor (Map: Luzon, F 6). It was occupied by American troops under General Young on October 12, 1899, during the Filipino insurrection. Population, 1903, 12,904.

AR'BACES (Gk. 'Αρβάκης, *Arbakēs*). According to Ctesias, a general of Sardanapalus (i.e. Asshurbanipal), King of Assyria, who in connection with Belesys, commanding the Babylonian troops, organized a conspiracy against Assyria, and after defeating Sardanapalus (B.C. 876), founded the Median Empire. The dynasty established by Arbaces lasted till its overthrow by Cyrus (c.559 B.C.). This account does not tally with what we now know through the cuneiform inscriptions of the manner in which Assyria fell (see Assyria), nor with our present knowledge of the founding of the Median Empire. Belesys may be a corruption of, or intended for, Nabopolassar, and if there is any historical basis for Ctesias's account, Arbaces may be the name of the 'Scythian' chief who joined Nabopolassar in the attack upon Assyria under the last king, Sin-sharishkun, or the name may even be a distortion of the latter.

AR'BACES. (1) The king of Iberia in Beaumont and Fletcher's *King and No King.* (2) The ruler of Media in Byron's *Sardanapalus.*

AR'BALEST (Lat. *arcus*, bow + *ballista*, a military engine, from Gk. βάλλειν, *ballein*, to throw), Arbalist, Arcubalist, Arblast. A weapon of indefinite antiquity, known also as cross-bow or bow-gun. Some Roman forms are depicted on extant monuments, and it was from the Romans, possibly indirectly, that the arbalest in use in the Middle Ages was derived. It was employed chiefly in the Twelfth Century and later, although it was not unknown in the Tenth and Eleventh centuries. There were at least eight distinct forms, varying in size and construction. Some were carried by foot-soldiers, others were permanently fixed on fortifications like modern cannons; some hurled short, thick arrows (called 'quarrels' or bolts); others shot stones, leaden balls, or other projectiles. The larger ones were worked by placing the foot in a loop, drawing the cords up with the hands, while the gun was maintained in an inverted position. When the weapon became so improved that the bow was made of steel, it required, in order to bend it, a separate machine called a 'moulinet.' In the crude formations of mediæval tactics the arbalestiers or cross-bowmen were an important branch, and were usually advanced to the first line of battle. They were divided into two branches, the mounted and dismounted, and their supplies of arrow ammunition were carried in carts. The use of the arbalest against Christians was prohibited by the Lateran Council of 1139 on the ground that it was "a thoroughly diabolical weapon." But this prohibition was ineffective. Richard the Lion-Hearted was noted for his skill with the arbalest. One clause of the Magna Charta prohibited King John from employing foreign cross-bowmen. In the Fourteenth Century the arbalest was superseded in England by the long-bow. See Archery.

ARBE'LA (Gk. Ἄρβηλα, Assyr. *Arbailu*, the city of four gods, from *arba*, four + *il*, god). An ancient town of Assyria, now the Turkish town of Erbil or Arbil, situated in latitude 36° 9′ N., longitude 44° 4′ E., to the southwest of Mosul. It is famous as having given name to the battle in which Alexander finally defeated Darius, B.C. 331. The battle was really fought near Gaugamela to the northwest of Arbela.

AR'BER, Edward. An English scholar, Fellow of King's College, London, and emeritus professor of English literature in Mason College, Birmingham. To him English scholarship is greatly indebted for many careful reprints. They comprise *Tyndale's New Testament, 1525* (1871); *A Transcript of the Registers of the Company of Stationers of London, 1554-1640* (1875); *English Reprints* (14 vols., 1868-71); *An English Garner* (8 vols., 1877-96); *An English Scholar's Library* (16 nos., 1878-84); *British Anthologies* (10 vols., 1899-1900); *The First Three English Books on America* (1885); *The Story of the Pilgrim Fathers, 1606-23* (1897).

ARBITRAGE, är'bĭ-trāj *or* är'bĭ-träzh' (Lat. *arbiter*, umpire, judge). A term applied to transactions which take advantage of differences of prices for the same articles in different markets. At the same time that the trader buys in the cheaper market, he sells in the dearer. The margin between the two prices must be sufficient to do more than cover the costs of exchange to insure a profit. The rate of profit is of necessity small, being frequently measured in small fractions of one per cent. The objects of such arbitrage transactions may be bullion or coin, bills and exchanges, or stocks and bonds.

AR'BITRA'TION (Lat. *arbitratio*, judgment, from *arbiter*, umpire, judge). The submission of a dispute, which might otherwise be the subject-matter of a civil litigation, to the decision of a private person instead of a court of justice. This is not permitted in criminal cases; nor are the parties to a civil dispute necessarily bound by an agreement to arbitrate, even though the agreement be upon a valuable consideration. At common law, contracts for the adjustment and settlement by arbitration of all disputes and differences between the contracting parties are not treated as binding so as to oust the jurisdiction of the courts. For example, if a landowner grants to another the privilege of laying water-pipes across certain land, in consideration of the latter's payment of a specified sum, and of his agreement to pay all damages caused by the breaking or leaking of the pipe, a stipulation that the damages shall be fixed by arbitration is not enforceable. The landowner can maintain an action at law for any damages so caused, and refuse to abide by his agreement to arbitrate them. This, it has been judicially declared, both in England and the United States, rests "upon the general policy of the law, that parties cannot enter into a contract which gives rise to a right of action for the breach of it, and then withdraw such a case from the jurisdiction of the ordinary tribunals." On the other hand, if a property-owner and an insurer enter into an agreement that the former shall pay a certain premium, in consideration of which the latter, upon the destruction of the property, shall pay the former such a sum of money as shall be settled and ascertained by arbitration, the contract is binding in all of its provisions, and the insured has no cause of action until an arbitration has been had, or it has been prevented or dispensed with by the insurer. The legal distinction between these two classes of cases is well established, but it is not always easy to determine within which class a particular controversy falls. If it falls within the first class, either party has the power to revoke the arbitration, even after his submission of the dispute to the arbitrator; although by so doing he subjects himself to an action for damages for breach of contract, if his agreement to arbitrate was upon a valuable consideration.

This power of revoking a submission has been modified by statute in England and in many American jurisdictions. It is provided, in some of our State constitutions, that the legislature shall enact laws providing for arbitration, or shall establish courts of conciliation. The tendency of modern statutes is to extend the limits of private arbitration, to conform the proceedings therein, so far as practicable, to those of a court or an official referee, and to give to an award of arbitrators the force and effect of a judicial decision. In the absence of legislation, however, a judgment cannot be entered on an award, nor can the determination of an arbitrator be enforced by execution. If the defeated party refuses to carry out the award, his opponent must sue upon it. There is no appeal from an award, as there is from the decision of an inferior court; but it may be corrected in some cases, and it may be set aside for various reasons, such as fraud practiced by the prevailing party, or misconduct on the part of the arbitrators, or their failure to conform to the terms of the submission. As a rule, however, an award will not be set aside for purely technical or formal defects. Unless some flagrant error in the proceedings is disclosed, courts are disposed to uphold an award in an arbitration to which the parties have assented, and on which they have been fairly heard. Consult: Morse, *Law of Arbitration and Award* (Boston, 1872); Watson, *Treatise on the Law of Arbitration and Awards*, third edition (Philadelphia, 1848); Russell, *A Treatise on the Power and Duty of an Arbitrator and the Law of Submissions and Awards*, eighth edition (London, 1900).

AR'BITRA'TION, INTERNATIONAL. The settlement of disputes between states by judges of their own choosing and in conformity with their respective rights. Arbitration tribunals may be special or general, temporary or permanent, restricted or open. It is essential that the contracting states formally agree to refer their differences to an independent tribunal and bind themselves to abide by its award. The persons or states chosen as arbitrators should formally accord their consent and accept the obligation. The reference is usually made by special agreement signed on behalf of the contending parties, stating the questions to be submitted, summarizing the points of law or fact involved, defining the limits of the arbitration, and in cases indicating the course of procedure.

Arbitration is largely an outgrowth of the complex international relations of the Nineteenth Century, and the consequent development and recognition of international duties and liabilities. The attitude of Greek civilization toward the barbarian world rendered conciliation impossible; while among the Greeks themselves arbitration was confined rather to questions touching upon religion, commerce, and boundaries, than to great political questions. The foreign policy of Rome contemplating universal conquest precluded the employment of referendum methods. During the Middle Ages, under the influence of religious and feudal ideas, arbitrations were frequent. The predominance of the popes, as delegates of God, constituted them the natural judges of all international causes, and brought to their tribunal many of the differences between kings and peoples. The great prelates were often chosen as voluntary arbitrators, though perhaps oftener on occasions involving private interest and internal policy than on those of actual international conflict. One of the most celebrated of arbitration decisions is that of Pope Alexander VI., tracing an imaginary line from pole to pole in his division of all lands discovered in the New World between Spain and Portugal. Even after the decline of papal supremacy, Gregory XV. acted as arbitrator of the question of the 'Valtelline' forts in the Seventeenth Century, and Pope Clement XI. gave the casting vote as umpire between Louis XIV. and Leopold I., the chosen arbitrators by Article 8, of the Treaty of Ryswick. Under the feudal system, vassals were naturally predisposed to look to their lords for the determination of their conflicting claims. The efforts of the emperors of the Holy Roman Empire to succeed to the position of the popes in this regard resulted in an occasional recognition of their jurisdiction—never of their supremacy. With the establishment of absolute monarchies, arbitration declined.

The change in international relations produced by modern means of transportation, with the resultant complex social and political intercourse and the vast economic loss involved in modern war, has tended more and more to the employment of the method of arbitration in international disputes, and its gradual recognition as the most humane, economical, and enduring method for their determination. The questions submitted involve not only the adjustment of claims relating to the rights of nations as between themselves, but also those of individuals against foreign governments. During the Nineteenth Century there were over one hundred and thirty important arbitrations, and almost as many more minor commissions for the settlement of purely financial claims. Both in the numbers and the questions involved the United States and Great Britain have unquestionably led the way. The most important of these is the Treaty of Washington (q.v.), of which one article instituted a Joint High Commission, which at Geneva in 1871 determined the questions relating to the *Alabama* Claims (q.v.). Besides actual causes submitted for settlement, various international conferences have been held and conventions adopted, some of which are:

The proposal for the establishment of a permanent court of arbitration, made by the Committee of the International Law Association, which met at Brussels in 1895; the Interparliamentary Conference on Arbitration and Peace, at Brussels in 1897; the proposal for the arbitration for the settlement of disputes between the States of North, Central, and South America, signed at Washington, 1890; the Anglo-American Arbitration Treaty, signed at Washington, January 11, 1897, but never ratified by the Senate of the United States; the Italy-Argentine Republic General Treaty of Arbitration, signed at Rome, July 23, 1898; The Hague Convention, adopted at a plenary meeting of the Peace Conference at The Hague, July 29, 1899; the submission by the powers, in 1903, of the question of preferential treatment to be accorded by Venezuela to the blockading powers, to arbitrators chosen from The Hague Tribunal; the conclusion of arbitration treaties between Great Britain and France (1903); between Great Britain and Italy; Great Britain and Spain; France and Spain; and France and Italy (1904), by the terms of which disputes not affecting the vital interests of the contracting parties are to be submitted to The Hague Tribunal for adjudication; a treaty between Holland and Denmark (1904), providing that all disputes of whatsoever nature shall be submitted to The Hague Tribunal; arbitration treaties concluded by the United States with Germany, Great Britain, Italy, Spain, and Portugal, in 1904, for the submission of judicial disputes and disputes relating to the interpretation of treaties to The Hague Tribunal (not ratified by the United States Senate); in September, 1905, the Czar invited the powers to another Peace Congress.

The arbitration treaty between Great Britain and the United States mentioned above, provided for the submission of all questions failing of diplomatic adjustment to arbitrators. The questions were thus divided: (1) Pecuniary claims not aggregating £100,000, not involving territorial questions; (2) pecuniary claims of over £100,000, not involving territorial questions; (3) questions involving rights of a territorial nature. The tribunal for the settlement of the first class of questions was to be composed of three members; for the second, of five; for the third, of six. The odd member in each of the first two classes was to be selected by the United States Supreme Court and the British Judicial Committee of the Privy Council, acting jointly, or, on their failure to agree, by the King of Sweden and Norway. The decisions of these courts were to be final. For the last class, the court was to be composed of three members of the United States Supreme Court and three members of the British Supreme Court of Judicature. Only awards in which five of the six concurred were to be final. For the provisions of The Hague Arbitration and Mediation Convention, see HAGUE PEACE CONFERENCE.

The following is a list of some of the principal arbitrations and adjustments to which the United States has been a party:

(1) Between the United States and Great Britain, under the Jay Treaty of 1794, providing for three mixed commissions: one to settle the identity of the Saint Croix River, on the northeastern boundary; one to determine the compensation for impediments imposed by some States to the collection of debts by British creditors, in violation of the treaty of peace; a third to settle the question of contraband, rights of neutrals, and finality of decisions of prize courts.

(2) Between the United States and Great Britain under the Treaty of Ghent, 1814, providing for three commissions: one to settle the ownership of certain islands in Passamaquoddy Bay and the Bay of Fundy; a second to determine the boundary of the United States from the Saint Croix to the Saint Lawrence; a third to determine the boundary of the United States along the middle of the Great Lakes to the water communication between Lakes Huron and Superior, and to the Lake of the Woods.

(3) Between the United States and Great Britain, in 1818, regarding the obligation of Great Britain to restore slaves in the British possessions at the time of signing the Treaty of Ghent. Referred to the Emperor of Russia, who decided that the United States was entitled to compensation for slaves transported from territories restored under the treaty. Two mixed boards created to determine the claims disagreeing, the sum of $1,204,960 was finally accepted by the United States.

(4) Between the United States and Spain, in 1819, regarding the satisfaction of American claims against Spain during her occupation of Florida. By the terms of the Treaty of Florida, the United States agreed to settle these claims.

(5) Between the United States and Great Britain, in 1827, for the settlement of the northeastern boundary. The King of the Netherlands was chosen arbitrator, but his award was not accepted by the United States. The matter was compromised in the Webster-Ashburton Treaty.

(6) Between the United States and France, the claims of American citizens growing out of French depredations at sea during the Napoleonic wars, and the French Beaumarchais Claim, and claim to special commercial privileges under the Louisiana Cession Treaty, were adjusted by Minister Rives in 1831 by an indemnity to the United States of $5,558,108.07.

(7) Between the United States and Great Britain, in 1846, to settle the San Juan water boundary. It had been decided to continue the line southerly from the middle of the channel separating Vancouver's Island from the continent, through the Fuca Straits to the Pacific Ocean. The dispute as to the latter portion of the boundary was referred to a commission which disagreed. By the Treaty of Washington (1871) the question was referred to the Emperor of Germany, who sustained the American claims to the Haro Channel. This boundary was finally fixed by the protocol of 1873.

(8) Between the United States and Great Britain in 1855 to determine by a mixed commission the "Reserved Fisheries Rights" under the Reciprocity Treaty of 1854, which renewed the privileges renounced in 1818, of taking and curing fish in "unsettled bays, harbors, and creeks" along the Canadian shore. The commission defined "rivers and river-mounts" reserved under the treaty, and concluded its work in 1866.

(9) Between the United States and Great Britain under the Treaty of 1863, by which the claims of the Hudson's Bay and Puget's Sound Agricultural Companies arising under the Oregon Treaty (Treaty of 1846) were settled by two commissioners, who chose an umpire. They awarded

$450,000 to the Hudson's Bay Company, and $200,000 to the Puget's Sound Company. In return the companies executed deeds of release of their claims in the Oregon region to the United States.

(10) Between the United States and Venezuela, in 1866, by a mixed commission—one from each State, and an umpire, to settle American claims. The award of $1,253,310.30 to the United States was impeached for alleged fraud. By treaty in 1885 these claims were resubmitted to a similar commission, which, in 1888, awarded $980,572.60 to the United States.

(11) Between the United States and Mexico, in 1868, for various claims and counterclaims subsequent to the Peace of Guadalupe-Hidalgo, in 1848. The award was rendered in favor of the United States; but objection was raised later to some of the evidence admitted. Pending the investigation of these charges, distribution has never been made of the funds.

(12) Between the United States and Great Britain, in 1871, by the terms of the Treaty of Washington, providing for the submission to arbitration of: (1) The San Juan water boundary (see 7). Referred to the Emperor of Germany, who sustained the American claim. (2) The Nova Scotia fishery rights. (3) Claims and counterclaims growing out of the Civil War, other than the *Alabama* claims. (4) The *Alabama* claims (q.v.). Under the second, an award of £1,100,000 was given to Great Britain, and under the third £386,000.

(13) Between the United States and France, in 1880, for claims for injuries growing out of the Mexican War of 1862-67, the Civil War, and the Franco-Prussian War. An award of $612,000 was rendered against the United States.

(14) Between the United States, Great Britain, and Germany, in 1889, to determine their claims in the island of Samoa. The appointment of the Chief Justice of Samoa was referred to the King of Sweden and a joint commission established. In 1899 complications arose, resulting in a joint high commission proceeding to the Samoan Islands. There resulted an agreement for their partition, signed in Washington, December 2, 1899.

(15) Between the United States, Great Britain, and Portugal, in 1891, to determine the dispute arising from the seizure and annulment of the charter of the Delagoa Bay Railway, constructed by an American citizen. The claims were decided by three jurists appointed by the President of the Swiss Confederation.

(16) Between Great Britain and the United States, in 1892, regarding the Bering Sea seal fisheries. The commission gave a divided award, mainly in favor of Great Britain, in 1893; but in favor of the United States' admission of the necessity for regulation of pelagic sealing and the proposal for such regulations. Later, in 1896, a further commission was created to award the amount of damages due to Canadian sealers under the former decision. This was fixed at $471,151.

(17) Between Great Britain and the United States, in 1897, to determine the boundary between Alaska and Canada. After reaching a decision, the commissioner's work was interfered with by an act of the British Columbia Legislature. A subsequent determination of the question was reached on the same lines in 1899.

(18) Between the United States, Great Britain and Germany in 1899 for the adjustment of claims of German citizens arising out of the bombardment by American and British warships of Samoan villages.

(19) Between the United States and Mexico, in 1902, before The Hague International Tribunal, to decide which should be held liable for the payment of certain funds to the Catholic Church in California. The decision of the court was in favor of the United States.

(20) Between the United States and Russia, in 1902, in the Russian Seal Cases. The dispute grew out of the seizure in 1891 by a Russian cruiser of four American vessels in Bering Sea. The arbitrator decided in favor of the United States, laying down the principle that a war vessel may not pursue a vessel of another nation beyond territorial waters.

(21) The settlement, in 1903, of the Alaska Boundary dispute, by a joint commission representing the United States and Great Britain.

(22) Between Russia and Great Britain in 1905, to determine the responsibility for the firing upon British travelers by Russian warships on October 22, 1904. The arbitration was conducted by an International Commission, composed of admirals of the navies of Russia, Great Britain, France, the United States, and Austria. The majority of the commission found that the firing was unjustifiable, but that no discredit attached to the Russian admiral or the personnel of his squadron. As a result of the report of the commission, Russia promptly paid all claims for damages, aggregating £60,000.

Consult: Balch, *International Courts of Arbitration* (Philadelphia, 1896); Moore, *History and Digest of International Arbitrations to which the United States has been a Party* (Washington, 1898); Darby, *International Arbitration, International Tribunals* (London, 1900); and works under International Law.

ARBITRATION, LABOR. See Industrial Arbitration and Conciliation.

ARBOGA, är-bō̆'gȧ. An ancient city in Sweden, in the Province of Westmannland, 10 miles from the mouth of the Arboga River, by which, with the aid of a canal, the lakes Hjelmar and Mälar are united (Map: Sweden, F 7). Of all its churches, cloisters, and chapels, there only now remain the town and parish churches, the former with an altar-piece of Rembrandt's. Church assemblies were held here in 1396, 1412, 1417, 1423, and 1474; diets in 1435 (the first in Sweden), 1440, 1471, 1529, and 1561, in which last year also certain articles, known as the Arboga Articles, were passed, by which Eric XIV. was enabled to limit the power of the nobles; and in 1625 Gustavus Adolphus issued an edict here, commanding that the copper coin of the realm should contain its full worth of copper. Population, 1901, 5250.

AR'BOGAST (? -394). A Frank who became a distinguished general in the Roman service. During the reign of Gratian he successfully commanded an expedition against the Germans, and under Valentinian II. was commander in Gaul. After winning the favor of his army, he defied the authority of the Emperor, who was killed, probably by Arbogast's order, in 392. Eugenius, Arbogast's client, was proclaimed Emperor; but Arbogast, after suffering a defeat at the hands of Theodosius, near the river Frigidus, north of Aquileia, killed himself.

ARBOLEDA, ăr′bō-lā′dȧ, Julio (1817-62). A Colombian poet and political leader. He was born at Barbacoas and was educated in Europe. In 1856 he joined the Conservative revolt in Antioquia, and soon became the leader of his faction. He concluded an alliance with President Moreno, of Ecuador, and made war upon the Federalist dictator, Mosquera. With the support of the States of western Colombia, he assumed supreme power, but soon afterwards was assassinated. In a literary way he is chiefly known for his poems, which, including *Dios y la virtud*, *Estoy en la cárcel*, and *Mo aussento*, gave him high rank among Spanish-American poets. The manuscript of his most important work, *Gonzalo de Oyón*, was almost completely destroyed by an enemy, and only fragmentary copies are preserved.

AR′BOR DAY (Lat. *arbor*, tree). A day set apart by the legislatures of most of the States and Territories of the United States for the annual planting of trees by the people, and more especially by the school children. B. G. Northrop, while secretary of the Connecticut Board of Education, seems to have been the first—in 1865—to suggest the annual planting of trees under the direction of a State government. J. Sterling Morton was probably the first, however, to propose the setting apart of a certain day annually for the purpose, and in 1872, largely through his efforts, the custom was instituted in Nebraska. At present Arbor Day is observed in nearly every State and Territory; in some as a legal holiday, in others as a school holiday. In addition, several States, including New York, publish an Arbor Day manual. The exact date is not uniform throughout the country, though it generally falls late in April or early in May.

ARBOR DIA′NÆ (Lat., tree of Diana, the alchemic name of silver). An arborescent precipitate of metallic silver from a solution of silver nitrate, produced by the addition of a metallic element such as mercury. The proportions recommended are as follows: Dissolve twenty grains silver nitrate in one fluid ounce of water in a convenient bottle, add one-half dram of pure mercury, suspend a piece of zinc by means of a fine thread secured to the cork, and in a day or two the arborescent appearance will present itself.

AR′BORE′TUM (Lat., from *arbor*, a tree). A collection of specimen trees in a park or nursery. See Botanic Gardens; Forestry; Horticulture; Nursery.

AR′BORICUL′TURE (Lat. *arbor*, tree + *cultura*, care, cultivation). A term referring to the scientific cultivation of trees. It embraces that part of horticulture which treats of the planting and cultivation of ornamental and fruit trees, and that part of forestry known as sylviculture. The horticultural growing of various trees is discussed under the corresponding special headings. Forest practices are described under Forestry.

AR′BOR VI′TÆ (Lat., tree of life), *Thuja*. A genus of plants of the order Coniferæ, allied to the cypress, and consisting of evergreen trees and shrubs with compressed or flattened branchlets—small, scale-like, imbricated leaves. Species of arbor vitæ are found in the north temperate zones of both hemispheres. The common arbor vitæ (*Thuja occidentalis*) is a native of North America, especially between latitude 45° and latitude 49°, but has long been well known in Europe. It is a tree forty to fifty feet high; its branches are horizontally expanded, and the strobiles (cones) small and obovate. The young leafy twigs have a balsamic smell, and both they and the wood were formerly in great repute as a medicine; the oil obtained by distillation from the twigs, which has a pungent and camphor-like taste, has been recommended as a vermifuge. The wood of the stem is reddish, soft, and very light, but compact, tough, and durable, bearing exposure to the weather remarkably well. The tree is common in Great Britain, planted chiefly as an ornament. It seldom attains so great a size as in its native country. It flourishes in cool, moist localities. The Chinese arbor vitæ, *Thuja orientalis*, a native of China and Japan, which is immediately distinguishable from the former species by its upright branches and larger, almost globose and rough strobiles, is also, in Great Britain and upon the continent of Europe, a common ornament of pleasure grounds; but it does not attain so great a size as the preceding, and is more sensible of the cold of severe winters. The balsamic smell is very agreeable. The tree yields a resin with a pleasant odor, to which medicinal virtues were once ascribed; hence the name, *arbor vitæ*, given to this species and extended to the genus. There are several other species of Thuja, some of which seem well suited to the open air in the climate of Great Britain, and others require the protection of greenhouses. Among the former are *Thuja plicata*, California to Alaska, and *Thuja dolabrata*, a native of Japan, a tree of great height and thickness, which will not improbably prove one of the most important of the whole genus. In favorable forest conditions both Thuja occidentalis and Thuja plicata become rather large trees, the timber of which is very valuable. There are about sixty horticultural varieties of the American species, that vary in habit of growth, color of foliage, or other characteristics. Many of these are popular in landscape gardening. A tree common in North America and there known by the name of White Cedar is sometimes included in the genus Thuja, under the name of *Thuja sphæroidea*, but is more generally ranked in the genus Cupressus as *Cupressus thyoides*. See Cypress. Closely allied to the genus Thuja is *Callitris*. See Sandarac.

Fossil Forms. The genus Thuja, like many other forms of conifers, is represented by ancestral forms in Cretaceous rocks of northern Europe, and with the advance of time is found to migrate from northerly to more southerly regions, till during Miocene time it disappeared from Europe. Thuja is also known in the Miocene beds of Dakota.

ARBROATH, ăr-brŏth′ (Celt. *aber*, confluence, mouth + *Brothock*), Aberbrothwick, ăb′ĕr-brŏth′ĭk, or Aberbrothock, -ŭk. A seaport town in Forfarshire, Scotland, on the North Sea, about seventeen miles east-northeast of Dundee (Map: Scotland, F 3). Here King William the Lion founded a Tyronensian abbey in honor of Thomas à Becket in 1178. The King was interred in it in 1214. In the abbey, Bruce and the Scottish nobles met in 1320, to resist the claims of Edward II. to Scotland. Its ruins, which are cruciform, 270 by 160 feet, are very picturesque, presenting lofty towers, columns, Gothic windows, etc. The chief industries of Arbroath are flax-spinning, jute-spinning, and the manufacture of sail-cloth. The new harbor, begun in 1841, admits vessels of 400 tons; it is protected by a breakwater. The chief exports are grain, potatoes, fish, pork, and paving-stones. Arbroath is a royal burgh, and, in conjuction with Montrose, Brechin, Forfar, and Bervie burghs, returns one member to Parliament. Population, with suburbs, in 1901, 22,372. The famous Bellrock lighthouse stands in the sea twelve miles southeast of Arbroath.

ARBUÉS, ăr-bwās′, PEDRO (1441-85). A Spanish inquisitor. He was born at Epila, Aragon; became a member of the Augustinian College at Saragossa, and in 1484 was appointed first inquisitor of Saragossa by Torquemada, inquisitor-general. He was a tireless persecutor of all heretics, real or suspected, and was finally slain through a conspiracy of the friends of his victims. He was canonized by Pope Pius IX. in 1867.

AR′BUTHNOT, JOHN (1667-1735). A Scotch author and physician, the contemporary and friend of Pope and Swift. He was the son of an Episcopal clergyman, and was born at Arbuthnot, Kincardineshire. He studied medicine at Aberdeen, but took his degree at Saint Andrews. Arbuthnot's father lost his preferment at the outbreak of the Revolution. His sons' prospects being thus blighted in their own country, the family were compelled to go abroad to seek their fortune. John went soon after to London, and there supported himself by teaching mathematics. In 1697 he published an examination of Dr. Woodward's account of the Deluge, which brought him into notice as a person of unusual ability. Accident called him into attendance on Prince George of Denmark, who thenceforth patronized him. In 1709 he was appointed physician in ordinary to the Queen, and in 1710 was elected a member of the Royal College of Physicians. On the death of Queen Anne, in 1714, he lost his place at court, and his circumstances were never so prosperous afterward. In 1717, Arbuthnot, with Pope, helped Gay in a farce, entitled *Three Hours After Marriage*, which, however, proved a complete failure. In 1723 he was chosen second censor of the Royal College of Physicians, and in 1727 he pronounced the Harveian oration for the year. He died at Hampstead in 1735.

Arbuthnot's literary fame rests upon two humorous pieces. In 1712 he published the *History of John Bull*, one of the most amusing of political satires. After his death appeared (in Pope's *Works*, 1741) the *Memoirs of Martinus Scriblerus* (q.v.), in which all kinds of pedantry is ridiculed. John Bull as a nickname for England has been traced back no farther than Arbuthnot, and *Scriblerus* is one of the important sources of Sterne's *Tristram Shandy*. Arbuthnot was one of the most amiable of men. To him Pope addressed his best *Epistle*, and Swift said that if there were a dozen Arbuthnots in the world he would burn his *Travels*. Consult G. A. Aitkin, *Life and Works of Arbuthnot* (London, 1892).

ARBUTHNOT, MARRIOT (1711-94). A British admiral. He became a commander in 1746 and a captain in 1747; was commissioner of the navy at Halifax, N. S., from 1775 to 1778; became a rear-admiral in 1778, and in 1779 was appointed vice-admiral and placed in command of the North American Station. In conjunction with Sir Henry Clinton he captured Charleston, S. C., after a long siege, in 1780 (May 12), and in March, 1781, fought an indecisive engagement with a French fleet off Cape Henry. He surrendered his command to Rear-Admiral Graves in July, 1781, returned to England, and though he saw no more actual service, he became by seniority Admiral of the Blue in 1793. As a naval officer he was absurdly inefficient, being ignorant of even the rudiments of naval tactics, and as a man he seems to have been known to his contemporaries as a coarse and blustering bravo. Consult Ralfe, *Naval Biography* (London, 1820).

ARBUTUS, ăr′bû-tŭs *or* ăr-bū′tŭs (Lat., the wild strawberry tree). A genus of plants of the order *Ericaceæ*. The species, which number about twenty, are mostly European and North American shrubs and small trees. In many species the leaves are evergreen and shining, the branches usually smooth and red. Such a species is *Arbutus unedo*, the Strawberry Tree, extensively planted as an ornament in parks. It is a native of the south of Europe, and is not hardy in the colder parts of the United States. It is highly valued in California. The flowers, which are white, are produced in great abundance; the fruit, which resembles a strawberry in size and color, is ripened the second year. In this way flowers and fruits occur together, and, with the bright green leaves, make the tree very attractive. The fruit is edible and often utilized, especially in Spain, where sugar and a spirit are manufactured from it. A second species, *Arbutus Menziesii*, is the madroña of California. It is fairly hardy, and as a tree often attains a height of eighty to one hundred feet. *Arbutus Arizonica*, a tree forty to fifty feet high, has the bark of the trunk white, of the branches red, which, together with the pale-green leaves, make a pleasing contrast. A few fossil forms have been described under the name Arbutites, from the Eocene of Europe.

ARBUTUS, TRAILING (*Epigæa repens*). A prostrate or trailing plant, called Mayflower in New England and Ground Laurel in the Southern States, with evergreen leaves, rusty, bristly shoots, and axillary clusters of fragrant, rose-colored or white flowers, opening in early spring; found in sandy or rocky soil, especially in the shade of pines. It grows from Canada to Texas, but is particularly abundant in New England, the Middle and South Atlantic States, as well as in Michigan, Wisconsin, and Minnesota.

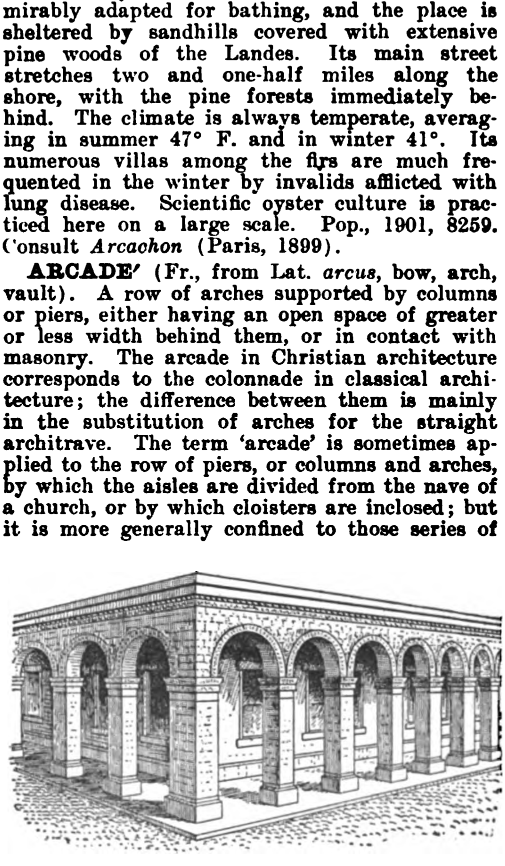
ARC (Lat. *arcus*, a bow). Any part of a curved line. It is usually limited to a part not including a cusp, and more particularly is applied to part of the circumference of a circle, as in the following statements: The straight line joining the ends of an arc is called its chord. Arcs of different circles are similar when they subtend equal central angles of their respective circles; if these circles are equal, so are the similar arcs. Circular arcs have the same numerical measure as the central angles which they subtend, and hence are commonly said to measure and to be measured by those angles. Like their subtended central angles, arcs may be considered as positive or negative and as exceeding 360° (see ANGLE). An arc is distinguished as major or minor, according as it is greater or less than a semi-circumference. The arc equaling in length the radius of a circle is called a *radian;* it is nearly 57° 17′ 44.8″. There are, therefore, 2π radians in a circumference.

ARC, ELECTRIC. See ELECTRIC ARC and ELECTRIC LIGHTING.

ARC, JOAN OF. See JOAN OF ARC.

ARCACHON, är′kȧ′shôɴ′. A French town and favorite watering-place on the Bay of Biscay, in the Department of Gironde, which has grown up since 1854, on the south side of the Bassin d'Arcachon, thirty-four miles southwest of Bordeaux by rail. The fine broad sands are admirably adapted for bathing, and the place is sheltered by sandhills covered with extensive pine woods of the Landes. Its main street stretches two and one-half miles along the shore, with the pine forests immediately behind. The climate is always temperate, averaging in summer 47° F. and in winter 41°. Its numerous villas among the firs are much frequented in the winter by invalids afflicted with lung disease. Scientific oyster culture is practiced here on a large scale. Pop., 1901, 8259. Consult *Arcachon* (Paris, 1899).

ARCADE′ (Fr., from Lat. *arcus*, bow, arch, vault). A row of arches supported by columns or piers, either having an open space of greater or less width behind them, or in contact with masonry. The arcade in Christian architecture corresponds to the colonnade in classical architecture; the difference between them is mainly in the substitution of arches for the straight architrave. The term 'arcade' is sometimes applied to the row of piers, or columns and arches, by which the aisles are divided from the nave of a church, or by which cloisters are inclosed; but it is more generally confined to those series of smaller arches which are employed simply for purposes of ornamentation. They form the main decorative feature of both outside and inside mediæval architecture, especially in the form of real or blind galleries, adding a play of light and shade, a richness of detail, and a variety of form that contrast with the early Christian simplicity and the exclusive use of color by the Byzantines. The term is also applied, improperly, to a glass-covered street or lane with a row of shops or stalls on each side.



ARCADE.

AR′CADELT, JACOB. A Flemish composer who assisted in founding the classical Italian school of music. The date of his birth is uncertain, but is believed to have been during the first quarter of the Sixteenth Century. His works are among the masterpieces of contrapuntal music of the Middle Ages. He was the most popular composer of his day, and his popularity induced many persons, for business reasons, to add his name to works written by others. During a residence in Rome (1539-55), as teacher and as singer in the Papal Chapel, he composed many madrigals. His works also include motets and masses. Arcadelt probably died about 1570-75, while in Paris with Cardinal Charles, Duke of Guise, whose service he entered in 1557. Consult: Burney, *General History of Music*, Vol. III. (London, 1789); Ambros, *Geschichte der Musik*, Vol. II. (Breslau, 1862-82).

ARCADES, är′kȧ-dēz. A masque written by John Milton in 1634 and published in 1645. It was acted shortly after *Comus*, before the Countess-Dowager of Derby, wife, first of Fernando, Earl of Derby, and afterwards of Thomas Egerton, Lord Ellesmere, when she was living at Harefield, near Uxbridge. It was set to music by Mr. Lawes at the same time. In it the Countess's guests appear on the scene in pastoral habit and move toward the seat of state with a prefatory song of compliment. A "genius of the wood" then comes forward and describes the significance of the occasion, after which the piece closes with two more songs of flattery.

ARCA′DIA (Gk. *'Αρκαδία, Arkadia*). The middle and highest part of the Peloponnesus, bounded on the north by Achaia, on the east by Argolis, on the south by Messenia and Laconia, and on the west by Elis. According to Pausanias, it derived its name from Arcas, the son of Callisto. Next to Laconia, Arcadia was the largest country in the Peloponnesus. It had an area of 1800 square miles, and was girt round by a circle of mountains, which cut off to a large extent its communication with the rest of the peninsula. Mountains also intersected it in different directions, forming a number of small cantons. The western part of what was anciently Arcadia is wild, bleak, and rugged, and covered with forests; the eastern is more fertile; and in the southeast are two plateaus, in which lay the chief ancient cities. The loftiest peak in Arcadia is Mount Cyllene, in the northeast, 7790 feet. The small rivers are either tributaries of the Alpheus (q.v.), or empty into inland lakes drained by underground channels (*katavothra*). The chief cities were Tegea (q.v.) and Mantinea (q.v.) in the southeast, and the great city, Megalopolis (q.v.), founded in B.C. 370 by Epaminondas as the capital of the Arcadian Confederacy. Further north were Orchomenus, Pheneus, Clitor, and Psophis. Owing to its isolation, Arcadia remained little affected by the Dorian conquest of the Peloponnesus, and its inhabitants were regarded as belonging to the original population of the peninsula; a belief confirmed by their dialect, which preserves some early forms and shows strong resemblances to the Cyprian. The nature of the country also prevented any lasting union among the inhabitants, and enabled the Spartans to maintain their supremacy until the battle of Leuctra. The confederation organized by Epaminondas had no real permanency, and until the Roman conquest the country was the scene of civil strife. The inhabitants were brave, hardy, and fond of fighting, so that they were in great demand as mercenaries. Among their shepherds and hunters the chief deities seem to have been Pan, Artemis, and Zeus, who was worshiped with human sacrifices on Mount Lycæon till a comparatively late date. A form of pastoral poetry seems to have developed in Arcadia, which was at first crowded into the background by the Sicilian bucolics of Theocritus; but later revived and influenced the Roman poets, whence Arcadia has become a synonym for an idyllic pastoral country of peace, innocence, and simplicity.

ARCADIA. The title of various pastoral romances, suggested, doubtless, from the use of the word in Vergil's *Eclogues*, where it is spoken of as a realm of bucolic content. One of these romances is by Sannazaro, and appeared at the close of the Fifteenth Century; another is by Sir Philip Sidney, and was published in 1590; a third is by Robert Greene, published in 1589; and a fourth by Lope de Vega, in 1598. In 1640 Shirley wrote a dramatization of Sidney's tale.

ARCA'DIUS (c.377-408). The first Emperor of the East (A.D. 395-408). He was born in Spain, and was the son of the Emperor Theodosius, after whose death the Roman Empire was divided into the Eastern and Western. Arcadius lived in Oriental state, and his dominion extended from the Adriatic Sea to the river Tigris, and from Scythia to Ethiopia; but the real rulers over this vast empire were, first, the Gaul Rufinus, and afterwards the eunuch Eutropius, who openly assumed the reins of government and the command of the army, while Arcadius reposed in luxurious indifference. In 399 Eutropius was deposed by another usurper, Gainas, who, in his turn, soon fell a victim to his own ambition. Afterwards Eudoxia, the wife of the Emperor, assumed the supremacy. One really great man adorned this period, the virtuous and eloquent Chrysostom, who was persecuted by Eudoxia, and through her influence exiled in 404, on account of his firm opposition to Arianism, which the Empress herself favored. During the reign of Arcadius his territories suffered by barbarian incursions, earthquakes, and famine, but nothing could disturb the indifference of the monarch. He died, unlamented, A.D. 408. See Honorius.

ARCA'NI DIS'CIPLI'NA. See Disciplina Arcani.

ARCA'NUM, The Great. In the Middle Ages the Latin word *arcanum*, literally meaning *secret*, was used of any of the most valued preparations of alchemy (q.v.); but the name *great arcanum* was especially applied to the highest problems of the science, the discovery of such supposed great secrets of nature as the elixir of life or the philosopher's stone.

ARC DE TRIOMPHE DE L'ETOILE, ärk de trē'ôɴf' de lȧ'twäl' (Fr., triumphal arch of the star). The largest triumphal arch in the world. It stands at the head of the Champs Elysées, Paris, and was begun by Napoleon in 1806, and completed by Louis Philippe in 1836. It was designed by Chalgrin, and is profusely ornamented with reliefs representing the Napoleonic victories, in commemoration of which it was erected. See Arch, Triumphal.

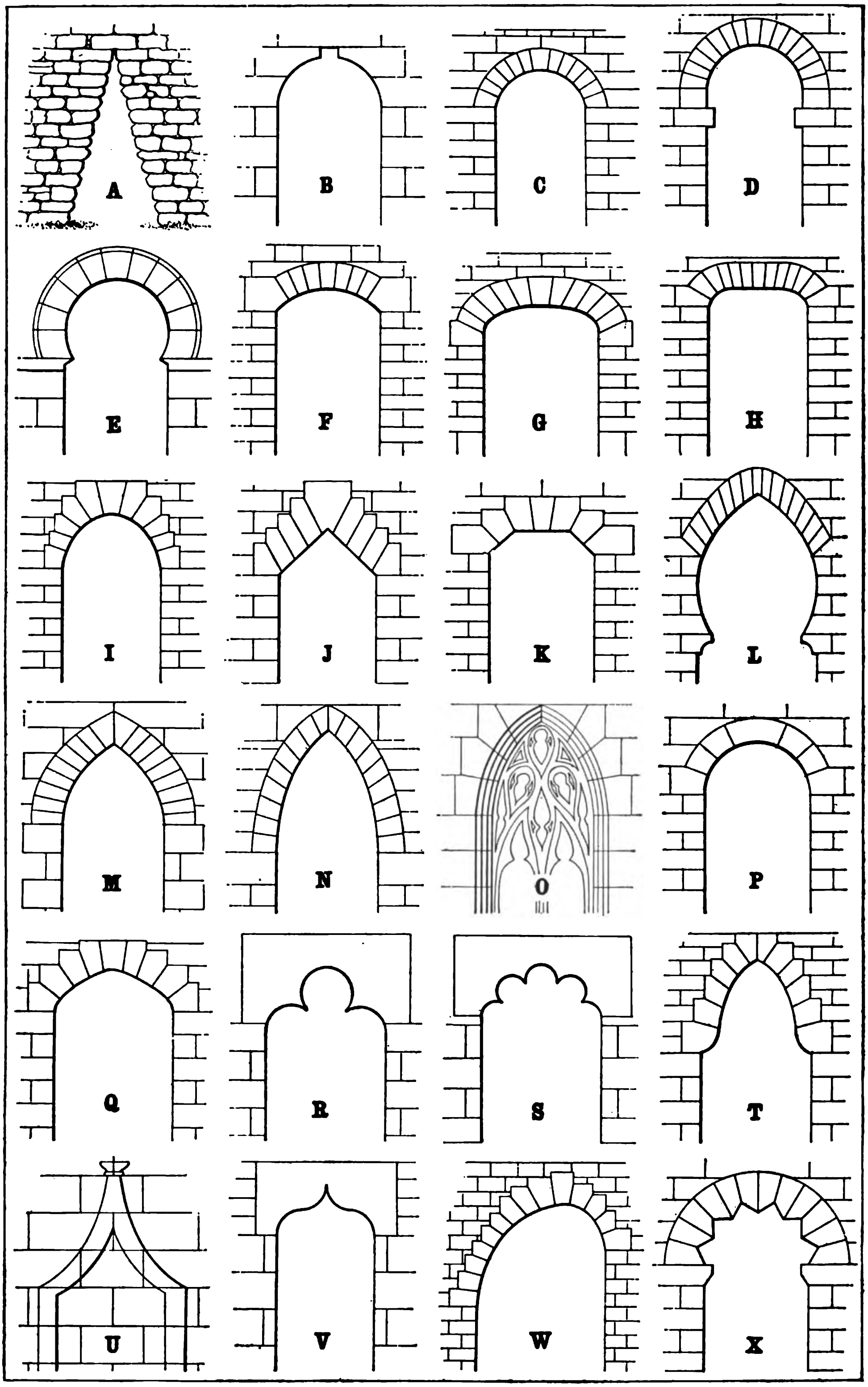
ARC DE TRIOMPHE DU CARROUSEL, ärk de trē'ôɴf' dụ kȧ'rōō'zĕl' (Fr., triumphal arch of the tilting-match). An arch built by Napoleon I. at Paris, in the square inclosed by the Tuileries and the Louvre, in commemoration of his victories during 1805-06. It is a smaller copy of the Arch of Constantine at Rome. See Arch, Triumphal.

AR'CE, *Span. pron.*, är'thȧ, Francisco (1822-78). A California pioneer. He removed to Alta California in 1833, and soon afterward became secretary to General José Castro, then commanding the Californian forces. In 1846, while bringing a number of horses, supposed to belong to the Californian Government, from Sonoma to the south, he was attacked (June 6) by a company of Americans, supposedly instigated by Captain John C. Frémont. The "Arce affair" attracted widespread attention, and marked the beginning of the Bear-Flag Revolt, which resulted in the seizure of California by the Americans.

AR'CESILA'US (Gk. 'Αρκεσιλαος, *Arkesilaos*) (B.C. 316-241). A Greek philosopher, founder of the Middle Academy. He was born at Pitane, in Æolis; studied philosophy at Athens, first under Theophrastus, the Peripatetic, and afterwards under Crantor, the Academician, and through the latter became acquainted with Polemon and Crates, by whom, as well as by Crantor, he was profoundly influenced in his philosophic views. After the death of Crantor, he became the head of the Academic school. Arcesilaus marks a reaction against the dogmatism of the Stoic school of philosophy, and an intended recurrence to the method and attitude of Plato and Socrates. He denied the Stoic doctrine of a "convincing conception," which he affirmed to be, from its very nature, unintelligible and contradictory. He also denied the certainty of intellectual and sensuous knowledge, and recommended abstinence from all dogmatic judgments. In practice, he maintained, we must act on grounds of probability. Though Arcesilaus confined his activity to teaching by the Socratic method, and wrote nothing, his influence on the future course of philosophic thought was far-reaching. He had clearness of thought, cutting wit, and readiness of speech; his frank and generous disposition charmed his opponents as well as his disciples. Consult Zeller, *Geschichte der griechischen Philosophie* (Leipzig, 1893).

ARCH (Lat. *arcus*, anything curved, a bow, vault, arch). A term used in architecture to designate any curved form that spans an opening or recess. It may be decorative, as a floral arch; or constructional, as a stone or brick arch. It may be a detached structure, a memorial or triumphal arch; or it may be a part of a large building. A constructional arch may be a false arch, consisting of horizontal courses of masonry, each projecting over the one below it, the edges being chamfered to give the form of the arch without the carrying function; or it may be a true arch, with a keystone, as is usually the case, and may be of the greatest variety of shapes: a primitive triangle, formed of two slanting stones; a flat arch, with wedge-shaped voussoirs; a segmental arch, or very low arch, used often within walls, as a discharging arch, for strength;

ARCHES



A. TRIANGULAR
B. SEMI-CIRCULAR, Primitive.
C. SEMI-CIRCULAR, With keystone.
D. SURMOUNTED.
E. HORSESHOE.
F. SEGMENTAL.
G. SURBASED OR OVAL.
H. DEPRESSED.
I. ELLIPTICAL.
J. INDENTED.
K. TRUNCATED ANGULAR.
L. LANCE-SHAPED
M. OGIVAL.
N. LANCET.
O. FLAMBOYANT.
P. FLAT.
Q. TUDOR.
R. THREE-LOBED.
S. FIVE-LOBED.
T. REVERSED OGEE.
U. INFLECTED, COUNTER CURVED.
V. OGEE.
W. RAMPANT.
X. ZIG-ZAG.

a usual round or one-centred arch; a stilted arch; a usual pointed or two-centred arch; a cusped or lobed arch (trefoil, quatrefoil, cinqfoil); a horseshoe arch; a reverse-curve or ogee arch; a basket-handle arch (both three-centred). The true arch is formed of voussoirs; the central one is the keystone, the lower ones are the springers. The inner side of the arch is the intrados, the outer the extrados. See ABUTMENT; ARCHIVOLT; SPANDREL; TIMBREL.

History.—The supporting power of the arch appears to have been known to most nations of antiquity, but the power was not regarded as artistic. The Egyptians knew the round arch, but relegated it to works of engineering and private architecture; the arch never appears in their temples, tombs, or any other large monuments. In this they held precisely the position held later by the Greeks. The arch in the Assembly Hall at Priene (time of Alexander), recently discovered, is supposed to be the only decorative Greek arch found; the few others are in fortifications, etc. But the Babylonians and Assyrians knew and used various kinds of arches in their palaces, tombs, and temples: the false arch; the pointed and the semicircular arches. All the openings in Assyrian palaces were arched. In ancient Italy, the Pelasgic and Etruscan populations used the arch in the same way for secular and sepulchral buildings; for gates, bridges, passages. Only in temple architecture, borrowed from the Greeks of the historic age, was the architrave supreme. This custom was inherited by the Romans, most of whose secular buildings were arched, while their temples were not. But the Romans of the Early Empire did not invent the arcade—that is, an uninterrupted series of arches supported on columns or piers. This was first introduced at Diocletian's palace in Spalato, and developed in early Christian religious architecture. Etruscans, Romans, and early Christians knew only the semicircular arch. But the Persians and Mohammedans, beginning in the Sixth and Seventh centuries, brought into use a variety of other forms: the pointed, the horseshoe, the ovoid, the stilted arches. These forms later penetrated sporadically into Europe, especially where there were political or commercial relations with the Orient. The pointed arch became, in fact, the favorite Mohammedan form. It was, perhaps, a knowledge of this Oriental usage that suggested to French builders of the time of the First Crusade the use of this form in vaulting; and thus was laid the basis for Gothic construction, though otherwise there cannot be any connection between the pointed style of the East and Gothic architecture. In Europe the round-arched style of the Romanesque Period was succeeded by the more flexible pointed style of Gothic. Gothic architects produced the greatest number of sub-forms and by-forms of the arch, not all of them pointed. Then the Renaissance returned to the round arch. Modern architects have no style to hamper them, and therefore use all kinds.

ARCH, TRIUMPHAL, or MEMORIAL. Usually a free-standing arch, spanning a road; though sometimes city gates and monumental doorways are turned into memorial arches. These arches are erected to commemorate triumphs or successful campaigns, or even great peaceful events, or an entire reign, or even a great family. They appear to have originated with the Romans. Nearly one hundred and fifty such Roman arches remain wholly or in part, of which about sixty are in North Africa. At Rome they were placed along the Triumphal Way followed by the triumphing general and his army from the Field of Mars to the Capitol. The custom spread from Rome elsewhere. The earliest arches mentioned at Rome are those of Stertinius (B.C. 196) and Scipio Africanus (B.C. 190). Then the Fabian gens erected one to itself (c.120 B.C.). But it was under Augustus that the custom took root everywhere, as is shown in the Roman Forum, at Aosta, Susa, Rimini, Fano, etc. From that time until the fall of the Empire in the Fifth Century such arches followed Roman dominion throughout the civilized world, and they are found in France (Saint Remy, Orange, etc.), Spain (Caparra, Bara), North Africa (Timgad, Tebessa, Thugga, Haïdra), Syria (Palmyra, Gerasa, Baalbek), Asia Minor, etc. The early arches were of stone and without much carving, being mainly arched bases for a group of triumphal statuary. But under the Empire, though still crowned by the triumphal quadriga and other figures in bronze, the arches themselves became of great artistic importance, and often represent the most successful effort of Roman genius at combining architectural and sculptural design. They were then built of marble. The number of openings varied from one to four, according as special arcades were or were not made for foot-passengers, or two main arches provided for vehicles in place of one. Still another favorite form was the Janus arch, or Tetrapylon, a solid cube, with arches at right angles, usually placed at the intersection of avenues, as at Philippopolis, Gerasa, and Rome. Few cities were built under the Empire without one or more of these arches, but only in Italy and South France were they profusely decorated with relief sculptures. The most perfect of all such sculptured arches is that of Trajan, at Benevento (A.D. 114); then come those of Titus (A.D. 80), Septimius Severus (A.D. 203), and Constantine (A.D. 312) at Rome, and that of Tiberius at Orange. The sculptures commemorated events of these emperors' reigns, and the attic contained the dedicatory inscription. One of the slenderest and most elegant is the one erected on the Mole at Ancona, to celebrate the enlargement of this port by Trajan. The Renaissance resurrected the arch after a lapse of a thousand years (Arch of Alfonso at Naples, Fifteenth Century), and it has since the Seventeenth Century steadily increased in popularity in Italy (Arco della Pace, Milan); France (Arc de l'Etoile, Arc du Carrousel); Germany (Brandenburger Thor, Berlin; Siegesthor, Munich), and America (Washington Arch, New York; Memorial Arch, Brooklyn). Consult: Baumeister, *Denkmäler des klassischen Altertums* (Munich, 1885-88); Daremberg and Saglio, *Dictionnaire des antiquités grecques et romaines* (Paris, 1881-92); Bellori, *Veteres Arcus Augustorum* (Rome, 1690); and Philippi, *Ueber die römischen Triumphalreliefe* (Leipzig, 1874).

ARCH, JOSEPH (1826—). An English labor leader. He was born in humble circumstances; was a farm laborer; educated himself, and became a Primitive Methodist preacher. In 1872 he headed the movement for the betterment of the condition of farm laborers in England, and founded and was president of the National Agricultural Laborers' Union. In 1873 he visited Canada and the United States to study the condition and prospects of labor, and the question of emigration. In 1885 he was elected to Parliament from Northwest Norfolk as a Liberal; was defeated in 1886, and reëlected in 1892 and in 1895. In 1898 his autobiography, edited by the Countess of Warwick, was published.

ARCHÆAN (är-kē'*an*) **SYSTEM** (from Gk. ἀρχαῖος, *archaios*, ancient). A name proposed by J. D. Dana, in 1872, for the entire series of crystalline rocks that forms the oldest underlying fundamental complex of the earth's crust. Earlier names applied to this series were: Azoic, Primitive, Huronian, and Laurentian, of American geologists, and *Urgebirge* and *Primitivgebirge* of the still earlier Germans, Werner and Lehmann. The rocks of this system consist of a complex series of gneisses, granites, and schists, with a host of associated massive igneous intrusions, all of which have suffered profound disturbances and metamorphism to such an extent that it is extremely doubtful if at the present day there exist any traces of their original characters. They form, as a rule, the cores of the great mountain masses, and are the original sources from which were derived, by erosion through countless ages, all the forms of later sedimentary rocks, which they underlie with marked unconformity. Various classifications of Archæan rocks have been made in the attempt to organize them into stratigraphic groups, but owing to the complex nature of the series, and to the almost complete absence of reliable data for determining the relative age of the component formations, no one classification has as yet received general recognition. These Archæan rocks of undoubted primeval origin, together with certain others, which because of their probable sedimentary derivation have been separated under the name Algonkian, antedate in respect of the time of their formation the rocks of the Cambrian system, and can be described to better advantage under the title, PRE-CAMBRIAN FORMATIONS, to which article the reader is referred for further information. See also ALGONKIAN SYSTEM; and TACONIC SYSTEM.

ARCHÆOLOGICAL (är'kê-ŏ-lŏj'ĭ-kal) **INSTITUTE OF AMERICA.** A society for the promotion of archæological investigation and research. It was organized in Boston in 1879, and now has eighteen affiliated societies, with headquarters in different American cities. The Institute founded the American School of Classical Studies in Athens in 1881; the American School of Classical Studies in Rome in 1895, and the American School in Palestine in 1900. These are supported partly by private subscription and partly by the aid of several American colleges. The society conducted important excavations of the site of ancient Assos in 1881-83, and has aided the School at Athens in its excavation of Grecian sites, notably that of the Heræum, in the Argolid. Besides the *American Journal of Archæology*, a bi-monthly magazine, the society publishes various papers and supplemental reports, and more important publications are in course of preparation, notably a facsimile reproduction of the Codex Venetus of Aristophanes, and important descriptions of the results of special archæological investigations. The society has about seventeen hundred members. Its presidents have been: Prof. Charles Eliot Norton, 1879-90; Seth Low, 1890-96; Prof. John Williams White, 1896-1903; Prof. Thomas D. Seymour, 1903—.

ARCHÆOLOGY, är'kê-ŏl'ō-jĭ (Gk. *ἀρχαιολογία*, *archaiologia*, antiquarian lore, from *ἀρχαῖος*, *archaios*, ancient + *λόγος*, *logos*, science). The science of antiquities—that is, of the material remains of ancient peoples. But from the fact that in its origin and development it has been primarily and chiefly concerned with the artistic and architectural remnants of the Græco-Roman world, it is often taken to mean the science of Greek and Roman antiquities, in which sense the term will be used in this article, without losing sight of the connection subsisting between these monuments and those of the more ancient peoples to whom they owe in great measure their inception.

As a science, archæology cannot justly be said to have existed before the last century, although the way had been gradually paved for it from the time of the Italian Renaissance. The passion for the artistic relics of Græco-Roman civilization, which at the end of the Fifteenth Century took such surprising hold upon the cultured classes of Italy under the Papal sway, led to the foundation of museums, in which were gathered statues of bronze and marble, vases, inscriptions, gems, jewelry, and coins, affording material for study and comparison. The spoils brought over from Greece by her Roman conquerors, and the mania for collecting treasures from the same source which had been displayed by many Roman amateurs, as well as the great artistic and architectural activity in imperial Rome under the guidance of Greek masters, rendered that city a mine for the early archæologists; and, furthermore, much filtered in from Greece itself. (Cf. Lanciani, *Ancient Rome in the Light of Recent Discoveries*, Boston and New York, 1889.) It must be admitted that these collectors were enthusiastic rather than scientific, and that the works of art discovered were ruthlessly restored to present a pleasing appearance, often at the complete sacrifice of accuracy. Heads and bodies of totally different style were frequently joined in hybrid works which still mislead the uninformed.

The father of modern archæology is Johann Joachim Winckelmann (1717-68) (q.v.), whose writings, although superseded in many points, are still of value, and who, by his genius, marked out the field since so successfully cultivated. He first presented to European scholars an authentic account of the discoveries made in the Campanian city of Herculaneum (q.v.), and, more than all, first wrote a systematic history of ancient art (*Geschichte der Kunst des Alterthums*, 1764; vid. Winckelmann's complete works, edited by Meyer and Schulze, Dresden, 1808-20). By a passage in Winckelmann's writings, Lessing was stimulated to the composition of his great æsthetic essay, "Laocoön," and Goethe also was powerfully influenced by him. Thus the seed of the new science was planted, to develop after the era of the wars of the French Revolution. Like his predecessors, Winckelmann was able to know Greek art only through the copies of the Roman period, or the few originals of later times; but even through this haze he was able to distinguish some of the characteristics of the period, and his works prepared the way for the better appreciation of the discoveries of the early Nineteenth Century.

Napoleon's invasion of Egypt opened the treasures of the Nile Valley to European scholars, and the discovery of the key to the hieroglyphic writing (q.v.) threw new light on the early history of the East. In Greece itself English scholars were at this time doing what could be done under the Turkish régime. The chief result was the splendid work of Stuart and Revett, *The Antiquities of Athens* (4 vols., 1762-1816). The expedition sent out by the Society of Dilettanti to continue their work accomplished but little. The true character of the art of the Fifth Century B.C. became clear when, in 1803-12, Lord Elgin brought the sculptures of the Parthenon to London. (See ELGIN MARBLES.) These, together with the reliefs from the temple of Apollo Epicurius at Bassæ, near Phigalia, in Arcadia, discovered in 1812, were subsequently acquired by the British Government, and form a most important part of the archæological treasures of the British Museum. In 1811 the same English and German explorers who subsequently brought to light the Phigalian marbles discovered the remains of the remarkable pedimental groups of the temple on the island of Ægina, which were purchased by Prince Ludwig of Bavaria, and placed in the Glyptothek at Munich. (See ÆGINETAN SCULPTURES.) The successful termination of the Greek War of Independence (1821-29) opened a new mine from which something was immediately realized by the French exploration of the Morea (Peloponnesus) in 1829, which brought to the Louvre the first specimens of the Olympic sculptures. Soon after, the little temple of Athena Nike rose again on the Acropolis of Athens, rescued from the Turkish bastion which had been built of its stones. In Sicily the exploration of the many Greek sites led to the discovery of the early sculptures of Selinus, while the systematic excavation of Pompeii (q.v.) brought to light the paintings and household ornaments of the First Century. At about the same time, the discovery of the great necropolises of Etruria, especially that of Vulci, in 1828, not only opened the whole field of Etruscan art, and especially of mural painting, to study, but also added thousands of vases, Greek and Etruscan, to the material for reconstructing the life and thought of the past. The importance of the vases, not for art alone, but for the study of daily life and mythology, was at once recognized; but unfortunately the strict methods of scientific interpretation were not at first followed, and for many years the wildest subjectivity sought to find a whole system of mystic symbolism in these gifts to the dead. Fortunately, this has now been generally superseded by a careful study of the language and methods of the Greek potter. This growth of material made necessary some organization of the laborers in the new science, and the foundation of the "Istituto di Corrispondenza Archeologica," by Bunsen, Gerhard, the Duke of Luynes, and others, on December 9, 1828, was one of the most important steps in the history of archæological progress. This institution, now the Imperial German Archæological Institute (Kaiserlich-Deutsches Archäologisches Institut), has, by its publications and by the training of young scholars, been of inestimable value. The French School of Archæology, established at Athens in 1846, as well as the activity which began to be displayed by certain Greek savants under the Bavarian régime, had also an important influence on the development of our science. An important part in this development was played by the pupils of F. A. Wolf, especially by A. Boeckh, whose aim was a complete reconstruction of ancient life, and who were therefore ready to welcome light from other sources than the literary monuments which had so long absorbed the attention of classical scholars. The discoveries of Layard at Nineveh (1845-46), and the subsequent decipherment of the cuneiform inscriptions, revealed the ancient civilization of Assyria and Babylonia, and gave new material for a more accurate estimate of the relative position of Greek culture and art. We must not omit to mention here the important addition made to the British Museum by the discoveries of Sir Charles Fellows in Lycia (1840), of Wood at Ephesus (1867-74), and of Newton at Branchidæ, Halicarnassus (q.v.), and Cnidus (q.v.).

The study of Greek inscriptions (see INSCRIPTIONS) under Boeckh and Franz, and of comparative linguistics under Bopp and his successors, contributed their share to the modern archæologist's equipment. We have now brought the account down to the last thirty years of the Nineteenth Century, during which a series of discoveries were made, whose full importance cannot yet be estimated.

The first place in this series must be given to the excavations of Heinrich Schliemann (q.v.) at Troy, Mycenæ, and Tiryns, which brought to light the remains of pre-Homeric Greece, and revolutionized our conceptions of the development of the early Ægean civilization. These discoveries have been supplemented and explained by the work of Flinders Petrie and others in Egypt, of the English on Melos, and especially by the most recent explorations in Crete. The peculiar Cypriote civilization, which first attracted attention in the collections of Cesnola, has since been studied scientifically by Ohnefalsch-Richter and other German and English scholars. Of the greatest importance in the development of archæological study in Greece has been the establishment of other foreign schools besides the French Institute in Athens. The first of these was the Athenian branch of the German Archæological Institute (1874), which was followed by the American School of Classical Studies (1882), the British School (1886), and a branch of the Austrian Archæological Institute (1897). Italy, Russia, and Denmark have also made provision for their archæologists who desire to study in Greek lands. Through the aid of foreign archæologists many of the most important excavations in Greece and Asia Minor have been made possible. Thus, the Germans have excavated Olympia (1875-81), Pergamus, Priene, and Miletus; the French, Delos and Delphi; the Americans, Eretria, the temple of Hera, near Argos (1892-95), and Corinth; the British, Megalopolis and Melos, and the Austrians, Ephesus. Side by side with the foreigners, has worked the Greek Archæological Society (Ἑλλενικὴ Ἀρχαιολογικὴ Ἑταιρία, *Hellenikē Archaiologikē Hetairia*), founded in 1836, and always one of the most active agencies in the exploration of Greek soil. To it is due the excavation of the southern slope and the summit of the Acropolis, the great sanctuaries of Eleusis, Epidaurus and Oropos, and the palace and many graves at Mycenæ. In Italy the progress of discovery has been somewhat limited by a refusal to permit foreigners to engage in the work; but archæological study flourishes not only among the Italians, but under the direction of the German and French Institutes and the American School (1895).

As may be inferred from this brief outline, archæology is an eminently progressive science, and in all its departments subject to constant revision. The steady increase of material, and the filling of gaps in the general structure, as well as continual correction or rejection of hastily formed theories and insufficiently supported conclusions, will occupy savants for generations to come. We can deal only provisionally with the most certain and generally accepted data, supplementing the statements of ancient writers by the monuments, and interpreting the monuments in turn by our literary sources.

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For our purpose we may divide the general subject of classical archæology, from an historical point of view, into the following periods:

I. Pre-Mycenæan Period, from the earliest times to c.1800 B.C.

II. Mycenæan Period, from c.1800 B.C. or earlier, to the Dorian conquest, c.1000 B.C.

III. Earlier Hellenic Period, from c.1000 B.C. to the era of the Persian Wars, c.500 B.C.

IV. Period of Hellenic Prime, from c.500 B.C. to the Macedonian supremacy, c.350 B.C.—the period of Phidias and Praxiteles.

V. Period of Hellenic Dissemination and Decline, from c.350 B.C. to the Roman conquest, c.150 B.C.—the period of Lysippus and of the Rhodian and Pergamene Schools, so called.

VI. Roman Period, from c.150 B.C. to c.150 A.D. or later—the period of the union and united achievement of Greek and Roman civilization.

For convenience, the consideration of Roman art, properly so called, will be reserved to the last period. Space will permit only a brief mention of the chief monuments and important characteristics of each period.

I. THE PRE-MYCENÆAN OR MINOAN PERIOD. This period has no definite chronological beginning, nor even a distinctly marked close. As its name shows, it includes the remains of the Stone and early Bronze ages, which by their position in the archæological strata, and their distinctive types, plainly preceded the appearance and spread of the highly characteristic civilization which marks our second period. This primitive age lasted much longer in some regions than in others. On the island of Cyprus it lingered in the interior long after the Mycenæan products had appeared on the coast. On the islands of the Ægean, at least on Thera, Melos, and Crete, it produced pottery, paintings, and buildings little inferior in merit to those of the succeeding age, though sufficiently distinct in character to indicate a non-Mycenæan origin. The period is represented by the lower strata, especially the second city, at Troy, the earliest remains on the Acropolis of Athens, and at Tiryns, and especially by the numerous graves on the islands of the Ægean—Amorgos, Syros, Siphnos, Naxos, Paros, and others—and the buried villages and tombs of Thera and Melos. As usual, the pottery is the most characteristic and abundant survival. In the earliest deposits it is hand-made, and often rude in texture and form, though some of the later ware, especially from Cyprus and Thera, shows considerable skill in molding. The decorations are commonly incised lines, sometimes filled in with a white substance. The color is usually gray or red (produced by burning), and the surface is smooth and polished. The burials are in cist-graves. Implements are chiefly of stone, though small objects of copper are found, and in the later remains bronze appears. Very characteristic are the rude "idols," images of terra-cotta and stone, which commonly represent a nude female, and have been associated by some archæologists with the cult of the great eastern goddess Ishtar or Astarte. Toward the end of this period a marked advance can be distinguished; the building of great walls and many-roomed dwellings shows increased power in dealing with material; walls ornamented in painted stucco, an increased use of bronze, and the introduction of the potter's wheel and painted decoration on the vases mark the transition from the rude civilization of the end of the Stone Age to the real splendor of the succeeding epoch. This period has sometimes been designated as that of the "Cycladic," or "Island," or "Carian" civilization, the former names being derived from the region where it has been best preserved, the last from a somewhat doubtful ethnological attribution. See MELOS; SANTORIN; TROY.

In the West this period is represented by the pre-Sicel, and first Sicel graves in Sicily, and the earlier remains of Italy. It may be noted here that the developments of the Bronze Age in Italy are independent of the Mycenæan Period. The products of Mycenæan art reached the West only as importations, and apparently late and in small quantities.

The most complete record of this civilization is to be found in the island of Crete, and especially at Cnossus where the excavations of Dr. Evans have made it clear that the culture enjoyed there the greatest longevity and the most unbroken continuity. Here in fact existed a civilization that, in its romotest limits, reached far back into the Neolithic Age, and was coeval with the predynastic life in Egypt, while its lowest limit was definitely set by the invasion, in the fully developed Mycenæan period, of people from the other islands, or more probably from the Greek mainland. An understanding of this Minoan culture, as it has been called, is best obtained by considering the finds at Cnossus.

On the eastern slope of the hill Kephala primitive pottery of blackish clay was found, handmade, hand-polished, and decorated with incised designs filled with white chalk. The same kind of ware was discovered by Schliemann at Hissarlik, and that coupled with the fact that it is always found at Cnossus associated with stone celts, and perforated maces of serpentine and other stone, shows that the civilization we are dealing with is that of a very primitive people. Furthermore, the deposit of yellow clay in which these finds have been made lead to the supposition that the race had advanced no farther than a form of living in which the houses were built of wattles daubed over with wet clay, the disintegration of which gave rise to the deposit already mentioned.

This early civilization lasted down to the period when copper and other metals began to come into use in the Ægean. At this time, without any break in the continuity of occupation—if one may judge from the finds—the people passed from their more primitive state, and began to use painted pottery instead of the polished, incised ware. This pottery, so distinctive of Crete, and called 'Minoan' by the discoverers, is characterized by the use of brilliant colors on a shiny black. The decoration is of two kinds—geometric and curvilinear—and is usually done in lustreless cream, or cream-white, yellow, orange, red, and crimson, on a slip that runs through grey-brown and to purple-black. The style often shows in the earlier stages a direct translation of the incised patterns of the Neolithic to the painted designs of the Minoan Age. This argues for an uninterrupted transition from the Neolithic into the Minoan civilization.

The people who now turned out the polychrome, Minoan pottery became the builders of great architectural constructions. At Cnossus is the same story of superimposition that one reads in the ruins of Hissarlik. An earlier palace rests on the neolithic remains, and on top of this first palace comes another later one. Gypsum blocks denote the earlier parts of the palace, while the later structure is shown by rubble work. This great structure, which might well have been the abode of Minos, ruler of the sea, speaks of a powerful people, whose magnificence must have far excelled that of the princes of Mycenæ. Curiously enough, very little gold has been found; but this is probably to be accounted for by the invasion that seems abruptly to have broken in upon the life at Cnossus.

The later changes that appear in the palace seem to be due to people of the Mycenæan age. At this time the ceramic style becomes less primitively naturalistic, and exhibits more Egyptian influences. The discovery of a small Egyptian figure, dating about 2000 B.C., is of great value in dating the later phases of the life at Cnossus. It was found on top of the neolithic stratum in connection with fragments of 'Kamarais' style, just antedating the Mycenæan. At a still later date come the frescoes which show men with vases, who closely resemble the Kefti (People of the Sea) of the Egyptian monuments of the 16th-15th centuries B.C. Moreover, the roundels found in the "throne room" of the palace approach in style the plaques of Tell El Yehudieh, which date from the early Thirteenth Century. Inasmuch as this room belongs to the latest period of the palace, we have a definite date for the close of the Cretan-Minoan civilization. The pottery of this time is that of the developed Mycenæan style. Since there is a remarkable absence of remains later than the best Mycenæan period, it is fair to assume that, at this date, the centre of gravity was transferred elsewhere—probably to the Greek mainland.

The excavations at Cnossus have thrown a deal of light on the question of the Mycenæan, or Homeric, palace. Here the building of the ruling prince is grouped around a great central court. On either side of this is a complex of rooms, sometimes grouped around their own halls, sometimes opening out as magazines from long corridors. The building moreover shows numerous stories, and in it are many of the conveniences that would conduce to the comfort of its occupants. In a retired part of the building is a series of rooms that seem to have been the private apartments of the prince, and associated with them a bath room, and a latrine connected by an elaborate system of drain pipes with a sewer that led outside of the building. Elsewhere in the palace is the so-called "throne room" with its *sella*, and bench for the councillors. Opening off of the room is a tank, used perhaps for supplying water for some ceremonial rite. From the numerous remains of the symbol of the 'double-ax,' found often in the frescoes and carved in the stones, it appears that there was some cult of the 'double-ax,' celebrated by the people who lived here. A shrine devoted to this worship was found in the building. Attached to the palace is a theatre, which seems to have been devoted to such spectacles as the bull-fights that appear in the wall paintings.

Of the artistic development of these Minoans we can form a fair estimate from the numerous wall paintings, the ivory carvings, seals, and the few bits of gold work. The paintings, which are often done with a beauty of facial expression not achieved again for centuries, are such as the cup-bearers, already cited as resembling the figures of the Rekhmara tomb in Egypt, or marine scenes, or a whole field of lilies, with a touch of naturalism in its wind-blown petals.

The discoveries at Cnossus (and the same civilization was found not only throughout the island but elsewhere in the Ægean) point to a highly developed race which, taking its origin perhaps as far back as 7000 B.C., in the Neolithic Age, lorded it in the Eastern Mediterranean anterior to the rise of Mycenæ. Indeed the culture represented by the finds at the latter place seems to point to a degeneration of the Minoan civilization. Perhaps, with Evans, we should call Mycenæan civilization "late Minoan."

II. MYCENÆAN PERIOD. The remains of this period were first brought prominently into view by the excavations of H. Schliemann at Mycenœ, and from this fact is derived the name adopted for this civilization. It is not to be supposed that Mycenæ was the centre from which the art spread, though the characteristic series of vases is more completely illustrated in Argolis than at any other single site. The characteristic products of this period have been found on the mainland of Greece in Bœotia (Orchomenus, Gha), Attica (Athens, Eleusis, Sparta, Thoricus), Thessaly (near Volo), and especially in Argolis and Laconia (Amyclæ); Delphi and the island of Cephallenia have also yielded Mycenæan remains. It will be noticed that these sites are for the most part in eastern and southern Greece. The same civilization is found on Melos, Thera, Amorgos, and at Ialysus, on Rhodes; but the most splendid remains are in Crete, which plays a prominent part in the heroic legends, and is now known to have had cities and palaces far finer than anything yet found on the mainland. Troy is also a Mycenæan site; but with this exception Asia Minor has not been brought within this culture.

The remains of this period fall naturally into several groups: (1) The fortifications, represented by the walls of the sixth city at Troy, a large part of those of Mycenæ, and especially the well-known wall surrounding Tiryns, as well as the defenses of many other less important sites. These walls are built of huge stones, roughly hewn, and laid in clay mortar. In general, there is only one great gate, though there are also smaller gates, or mere sally-ports. The gate is flanked by a large tower, and is often approached by a narrow and crooked passage. (2) The dwellings, chiefly the royal palaces. The latter are best seen at Tiryns, Mycenæ, and, above all, at Cnossus, in Crete. The usual plan shows a court, on one side of which is situated a great hall, containing the hearth, and approached through a vestibule. Around this hall and the court is arranged a complex of lesser rooms, and the whole structure is carefully placed inside the great fortification, which in general seems to have contained little but the residence of the ruler and his immediate dependents. The palace was built of wood and sun-dried brick, but the walls were stuccoed and painted, and metal incrustations, and decorations of carved alabaster and glass paste were often employed. The palace at Cnossus has yielded remarkable specimens of wall painting, and its plan shows a much greater extent than is found in Greece, but it is not as yet (1902) wholly cleared. The smaller houses found in some places, as at Melos, Troy, Crete, and Mycenæ, also show the large hall and its vestibule, but as a rule no further rooms. Additional accommodation seems to have been obtained by juxtaposition of unconnected buildings, rather than by a series of connected rooms. (3) The tombs form the third great class of Mycenæan buildings. The most important are the "bee-hive" tombs, of which the most notable examples are those of Mycenæ, and the so-called "Treasury" at Orchomenus, in Bœotia. These tombs are built of huge, carefully squared stones, laid in regular circles, so arranged that each course projects inward beyond the course below, thus making the interior a dome. The whole structure is held together by the weight of the earth outside, and therefore the side of a hill is usually hollowed out to receive the building, which is wholly concealed by the replaced earth. The approach is always by a long passage, with side walls of stone, and the façade of the tomb was richly decorated with columns and adornments in colored stone, elaborately carved. The interior was carefully smoothed and decorated with metal plates or rosettes. In some cases a small side chamber for the dead is found. Besides the great tombs, a series of similar grave chambers, cut in the rock, or excavated in the hillsides, and approached by similar passages, show the common Mycenæan mode of disposing of the dead. Burning seems to have been unknown at this time. (4) It is, however, in the products of its art, even more than in its architectural triumphs, that this period is sharply characterized. The excavation of Mycenæ and Tiryns yielded a series of painted vases, which still occupy a place by themselves in the history of Greek ceramics. Made on the wheel, of graceful form, they are decorated with marine plants and animals, birds, and, in the later work, rude drawings of men and animals. The decoration is by means of a "glaze" paint, varying from brown to black, or under intense heat becoming red. (For details, see VASES.) Even more marked are the gems and gold work of this time. The drawing is often rude, but the spirit and vigor are astonishing. The gold cups of Vaphio, with scenes in relief representing the capture and taming of wild bulls, shows an art which is not that of Egypt or Assyria, but, whatever its origin, has much of the quality which distinguishes the later Hellenic products. More Oriental in technique and decoration are the sword blades, inlaid with scenes of hunting and wild life, which much resemble objects found in Egyptian tombs. Of larger works of art, the noble lions over the gate of Mycenæ, and the rudely carved slabs which once marked the site of shaft graves, were for a long time the only representatives, if we omit the purely ornamental spirals and other motives forming part of the decoration of the façades. Crete, however, has yielded reliefs of bulls and other sculptures not yet published, which are said to show that the Mycenæan art did not confine its skill to small objects only. Space does not permit a detailed de-

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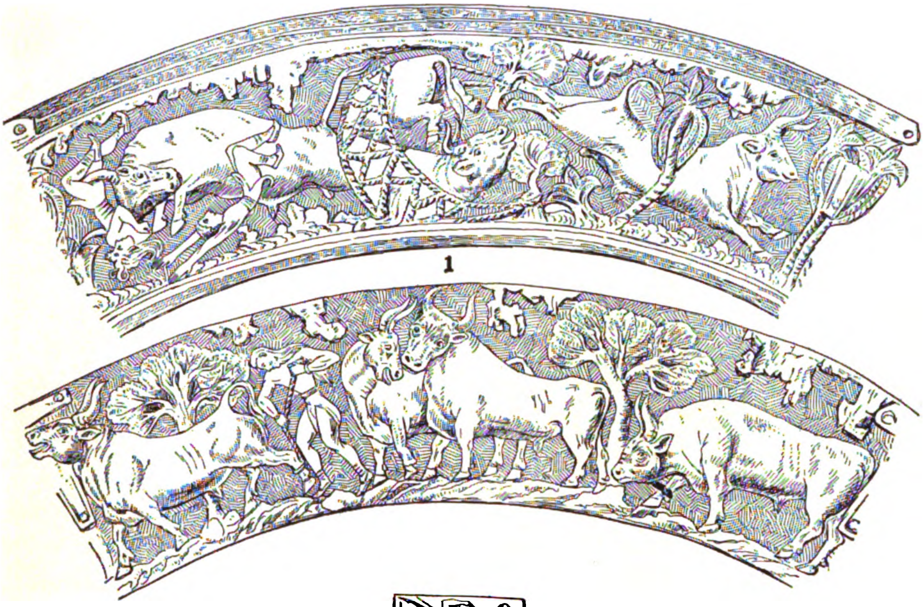

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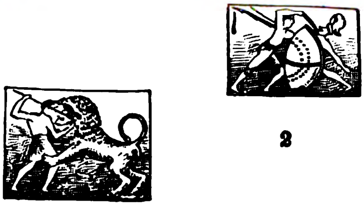

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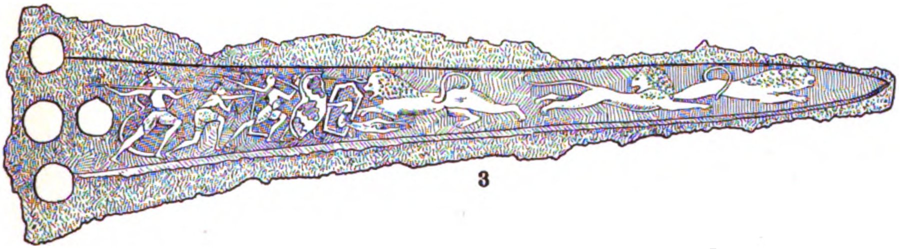

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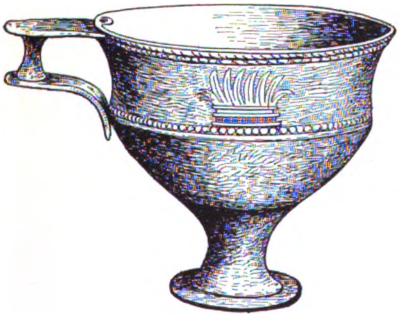

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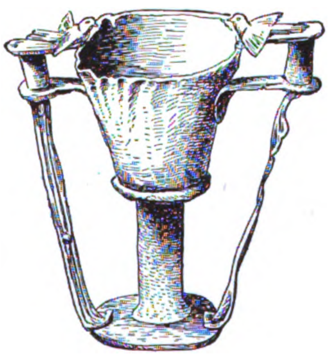
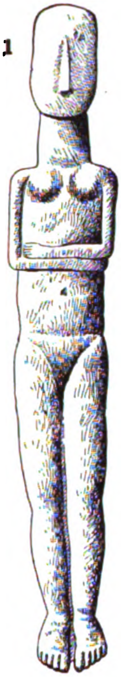


1. THE VAPHIO CUP.
2. GOLD INTAGLIOS.
3. INLAID SWORD BLADE.
4-5. TWO CUPS.

ARCHÆOLOGY—MYCENÆAN AND EARLY GREEK

1



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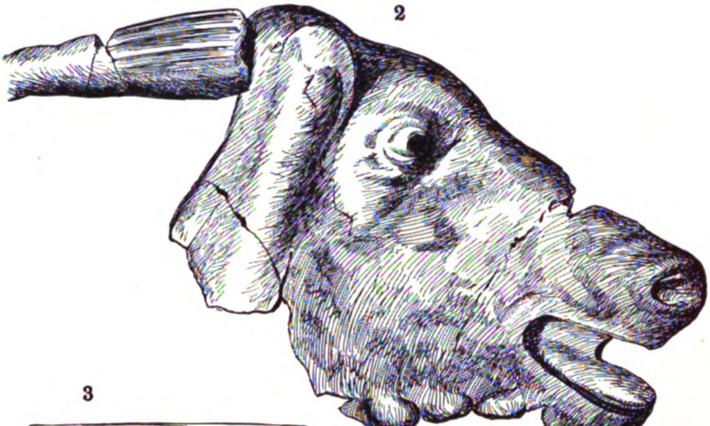

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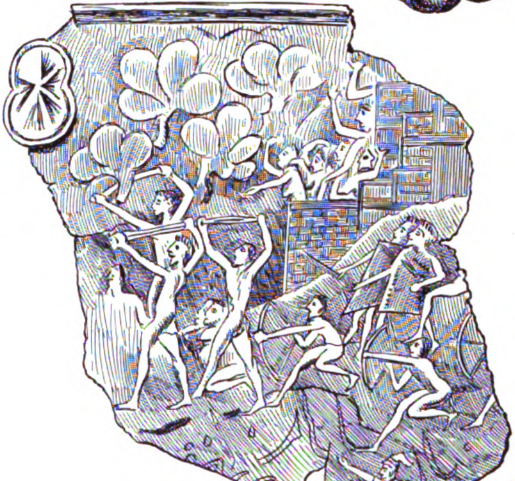

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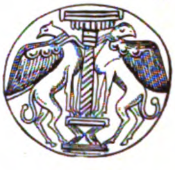

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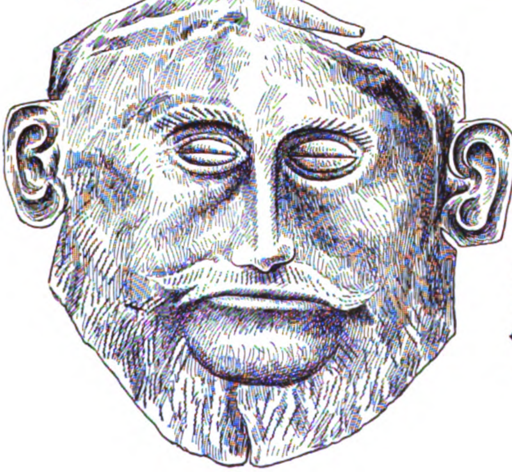

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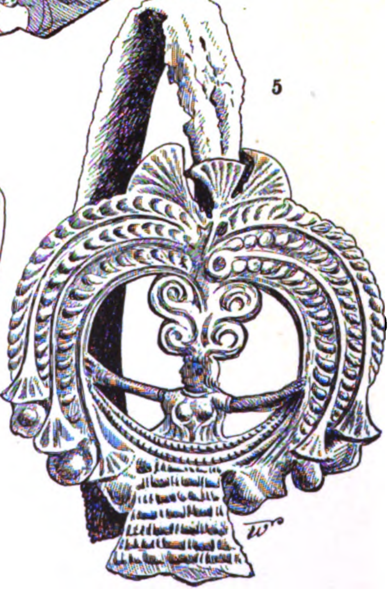


1. ISLAND IDOL.
2. HEAD OF BULL FROM CNOSSUS.
3. SIEGE SCENE FROM SILVER VASE.
4. GOLD MASK.
5. SILVER PIN AND GOLD ORNAMENT.
6. GEM.

scription or even list of the Mycenæan works; they may be found fully illustrated in the works mentioned below.

These two periods were not without their records. In Crete have been found tablets of clay bearing inscriptions in at least two different systems of writing, neither of which has been deciphered. See WRITING.

The ethnological relations of these civilizations are as yet an unsolved problem. Some scholars hold that we have here a more or less homogeneous race, developing along its own lines, but largely influenced by the intercourse with the East, which is clearly proved for the Mycenæan and later pre-Mycenæan periods. Some even go so far as to deny any Hellenic or Indo-European character to this race. Such views probably go too far. More probable is the view that, while the Stone Age and the earlier Bronze Age reveal to us the presence of a pre-Greek people, possibly the ancestors of the later Carians and Eteocretans, the Mycenæan remains belong to the conquering Greek race, the Achæans of the Homeric poems which contain a reminiscence of this early age of splendor, as preserved by the Greek colonists of Asia Minor. This is not to say that all the descriptions of the poems apply to life in this early age, for the poet has naturally used customs of his own time; and it is merely the general conditions and the traditional glories of the past that he has embodied in his verses. The chronological limits of these periods are determined by the presence of datable Egyptian objects in western sites, and more closely perhaps by the presence of Ægean importations in Egypt. The details are still much disputed, but the general results show that the later developments of the pre-Mycenæan Period may be placed from c.2500 B.C. to 1800 B.C., while the Mycenæan products were known in Egypt at least as early as B.C. 1550 in a well-developed form. The Mycenæan Age ends about B.C. 1000, or possibly a little later, and for a century or more before that time there is an obvious decline in artistic power. It must be remembered, however, that though superseded, the peculiar Mycenæan motives do not seem to have been lost, for they reappear at various points in the following period, especially in some of the local varieties of painted vases.

BIBLIOGRAPHY. Schuchhardt, *Schliemann's-Ausgrabungen im Lichte der heutigen Wissenschaft* (Leipzig, 1890), the best résumé of the subject, English translation, edited by Leaf (London, 1891); Milchhöffer, *Anfänge der Kunst in Griechenland* (Leipzig, 1883), a thorough and scientific discussion of the subject; Mitchell, *History of Ancient Sculpture* (New York, 1883), Vol. I. chap x., where Milchhöffer's work is summarized; Baumeister, "Mykenai," "Tiryns," "Kyklopenbau" in *Denkmaler des klassischen Alterthums,* admirably illustrated (Munich, 1884-88); Perrot and Chipiez, *Histoire de l'art dans l'antiquité,* Volume VI. (Paris, 1894); the English translation is sadly inaccurate and cannot be recommended; the work is richly illustrated; Tsountas and Manatt, *The Mycenæan Age* (Boston, 1897), a valuable summary at the date of publication; Hall, *The Oldest Civilization in Greece* (London and Philadelphia, 1901); Ridgeway, *The Early Age of Greece* (Cambridge, 1901); valuable for its material, but the author's theories are not generally accepted. Most of the recent reports and discussions are to be found in the periodicals named above.

III. EARLY HELLENIC PERIOD. The dark age, from the Dorian invasion to the rise of sculpture in the Seventh Century B.C., is bridged, from an archæological point of view, chiefly by the painted vases, the earliest varieties of which have been already mentioned. It seems clear that we are now in the presence of a new element. The whole style of ornamentation is changed. For the Age of Bronze we now find the Age of Iron. Gold ornaments are much rarer. The whole style of the pottery has changed. The prevailing decoration, not merely on vases, but on metal ornaments, is the 'geometric,' i.e. meander-patterns, circles, and various combinations of straight lines. The situation well agrees with the overturning of the old Achæan kingdoms by the invading Dorians, as pictured in Greek legend.

The funereal urns and other representatives of the so-called "Dipylon style" (from the Dipylon gate of Athens, in ancient tombs near which the finest specimens of this class have been discovered) appear to extend over a period from about B.C. 1000 to about B.C. 700 at latest. The patterns upon this pottery are "geometric," derived from carving and textile fabrics, rather than from nature, as in the Mycenæan ware. The human and animal figures upon them are eminently schematic and conventional. Figures of nautical scenes (sea-fights and the like) and funeral processions are prominent. The figured examples seem to be introduced later than those with merely a geometric pattern, though this style continues in use till the end. It is not improbable that Athens was the seat of its manufacture.

The Mycenæan influences seem to have survived on the islands and the Asiatic coast, where also the connection with the Orient was maintained, and in consequence we find in these regions the development of a number of local types, all strongly influenced by Oriental motives, and yet with well-marked peculiarities. The favorite decoration is with rows of animals; lions, boars, panthers, cattle, deer, as well as griffins and sphinxes, appear, either in procession, or grouped heraldically. By the Seventh Century these have crowded back the geometric types, and, further, the merely ornamental decoration begins to give place to actual scenes, either of daily life or from the legends of the past. For the pottery, see VASES.

About the opening of the Seventh Century begins the class of Corinthian vases still strongly Oriental, but later exhibiting the mythological scenes. The commercial importance of Corinth during the Seventh and Sixth centuries gave this ware a wide distribution, and many of the best specimens have been found in Italy. Chalcis also developed a local style of wide distribution, and both Corinth and Chalcis contributed to the formation of the Athenian style, which, taking its rise early in the Sixth Century B.C., as the result of a gradual transition from the Dipylon methods rapidly became so popular as practically to drive out of the general market all other styles. The reddish color of the clay was artificially heightened, and the decoration was applied in a very lustrous black paint, relieved only by the occasional employment of purple, red, and white. Toward the end of this period a new style, the "red-figured," begins to displace the "black-figured" technique. Here the body of the vase is covered with the black glaze, the figures being left in the color of the clay, while details are represented by fine black lines. The greater delicacy which this style made possible brought it at once into favor, and in it were executed the great masterpieces of Greek ceramic art.

Painting in Greek archæology can hardly be separated from ceramics, architecture, and sculpture before the time of Polygnotus (Fifth Century B.C.) We therefore take up next the consideration of these two latter developments, in brief outline, referring for details to the special articles on GREEK ART; and ARCHITECTURE.

The history of the origin of Hellenic architecture rests largely upon conjecture and reasoning from analogy. Although in its development, as known to us from existing monuments, we have to deal with it as manifested chiefly in temple-building (private dwellings being of comparatively little account among the Greeks), it is plain that we have to seek for its primitive principles in domestic structures, which were of sun-dried brick and wood. It is during this period that the temple forms became fixed, and the oldest stone buildings erected, though the full perfection of architecture is not manifested till the Fifth Century. The point, however, which chiefly concerns us in this place, is the rise of the two great orders, connected, as their names imply, with the two great branches of the Greek race—the Dorians and the Ionians. The main distinguishing marks of these orders are to be found in the form of the columns employed; and it is to these that we must turn our attention here, leaving the discussion of the several varieties of temple, whether *in antis* (with the front recessed and columns between the projections of the side walls), prostyle (with columns across the front), amphiprostyle (with a front at either end), or peristyle (surrounded by columns), as well as the details of the architrave and roof, for another page.

The Doric column, which we find to have been employed in the Heræum at Olympia, in the old temple at Corinth, and in those of Selinus, as well as in other buildings of this and the succeeding periods, and which is traceable to the Seventh Century B.C., is characterized in general by the absence of a distinct base (though this seems clearly to have been an original element of this species of column), by an outward sweep at the top called the echinus, and by a square plate (the abacus) between the echinus and the architrave, as well as by the fact that the edges of the fluting (q.v.) are sharp, and not flat, as in the Ionic. The nearest prototypes of this form of column, which is marked, particularly in the oldest examples known to us, by great heaviness of proportion, seem to be Egyptian, although Doric architecture offers a new element in the *entasis* (or slight bulge) in the shaft, which serves to correct a familiar optical illusion.

The Ionic column, on the other hand, which is of lighter and more ornamental design, has always a distinct base, with a succession of moldings above it, while the grooves in its shaft do not meet in arrises, but are separated by flat bands. Its chief point of interest, the capital, consists of double spirals, parted in the earlier forms by a palmette device. Over the origin of this form of capital much has been written; and although the question is not as yet settled, it seems likely that it goes back to an Oriental prototype, whether a conventionalized Assyrian palm-form or a derivative of the Egyptian lotus. See *American Journal of Archæology* 1886, pp. 1-20, "A proto-Ionic Capital," by J. T. Clarke; id., pp. 267-285, "A Doric Shaft and Base Found at Assos," same author (containing a full bibliography of the subject in both articles); Goodyear, id., p. 271 sqq. (an attempt to derive all palmette as well as lotus patterns from the Egyptian lotus), and especially, Puchstein, *Das ionische Capitäl* (Berlin, 1887).

The Corinthian capital, with its acanthus leaves, so extensively used by the Romans on account of its more elaborate character, may be considered a variety of the Ionic influenced by metal-work. It does not come into use until the next period, and was never very common until after the Fourth Century B.C. (Cf. Baumeister, op. cit., art. *Baukunst*, with the authorities there cited.)

While in painting, metal-work, and architecture, it is possible to trace the connection from the Mycenæan Age, in sculpture the line seems abruptly broken. It is not till the latter part of the Seventh Century B.C. that monumental sculpture, whether in the round or in relief, again begins to develop among the Hellenes. We find shapeless fetiches of wood and stone venerated in various parts of Greece down to the Second Century A.D., and later. A step beyond this primitive worship brings us to rude cultus-statues of wood and stone. We should expect the same Oriental influences to manifest themselves here as in the case of ceramic art; and when we look to the early statues themselves, such as the various so-called Apollo-figures of the Seventh and Sixth centuries (typical is the famous "Apollo of Tenea," in Munich), we seem to find unmistakably Egyptian elements. The angularity of the figure, the heavy masses of hair, the high set of the ears, the advancement of the left leg in such statues are unmistakable reminiscences of Egyptian works, with which the Greeks were especially brought into contact about this period. On the other hand, statues like the "Nicandra" of Islos, the "Hera" of Samos, and other closely draped female figures, with the feet just appearing below the drapery, may be compared with the seated statues from Branchidæ, in the British Museum, and with what seem to be their older Chaldæan prototypes from Tel-lo. The closely draped standing female figures show markedly the influence of sculpture in wood; either from the flat board, as the "Nicandra," or the round log, as the "Hera." Such works are frequently spoken of as *Xoana*. Though the inspiration for these types may have been derived from the Asiatic connections of the Ionians, and the trade with Egypt through Naucratis, the Greek artist was by no means a mere imitator, but early began to strive after development and variety along various lines.

The series of works of archaic sculpture from the period under discussion has rapidly increased through recent excavations, and we are able to trace with tolerable clearness the attempts made by the vigorous Greek artists to gain increased naturalness and lifelikeness in their figures, while gradually acquiring the full mastery of material and technique requisite for the free exposition of the sculptor's ideal.

To the opening of the marble quarries of Naxos and Paros we owe much. The marble thence obtained is a wonderfully fit material, easily worked, and in its very hue imitating human flesh. The earlier material had been wood or coarse limestone, the so-called "poros," which could not be given fine carving, and needed to be painted in order to show details. The early marble statues show that the technique of wood-carving, easily available for the softer "poros," was at first used for the new and harder material, and at all times color was largely employed in Greek sculpture.

Of inestimable value for the study of the sculptures of this period are the archaic statues discovered on the Acropolis of Athens, which certainly antedate (how much we cannot say) the Persian invasion of B.C. 480. The tyranny of Pisistratus in the Sixth Century certainly formed an epoch in the artistic as well as literary life of Athens, only to be paralleled by the Periclean Age. Material and style show that we have to do with various schools, partly the marble sculptors from the islands, partly the native Attic artists, developing along the lines of the heavier "poros" style, but largely influenced by the more delicate and elaborate Ionian developments. For an account of the painted decoration of some of the female statues, cf. an illustrated article by Russell Sturgis, in *Harper's Magazine* for September, 1890.

But the development of the period was not confined to Attica alone, nor merely to sculpture in the round. The pedimental groups of the gigantomachy from the Megarian treasure-house at Olympia, and of "Heracles and the Hydra" from the Acropolis of Athens, wrought in high relief from 'poros,' a sort of tufa, and, like all such work, stuccoed and painted, are also of special note, together with the early metopes of Selinus in Sicily; while the elaborate grave-stelæ of the wrongly so-called "Marathon Warrior" type, with complete polychrome decoration supplementing the details of the bas-relief, are the fore-runners of the exquisite monuments of the Ceramicus to be mentioned hereafter. To this period also belong the Æginetan marbles (see ÆGINETAN SCULPTURES) and the reliefs from the treasuries of Cnidus and Athens at Delphi.

Figures like the winged Victory of Archermus, and the sphinx, if not also the lion, show the influence of the East, particularly of the Asiatic Orient, in the sculpture of this epoch. But we feel, in contemplating the Acropolis statues, that we are on Greek ground, and that the artists are rapidly bringing in a nobler native art.

We have hardly entered upon the list of these important monuments; but it must suffice for this place to have indicated to some degree their relations, and we now pass to the mention of the kindred class of bronze works.

Together with the rude terra-cotta dedicatory figurines of early workmanship, we find also many small bronzes, which exhibit a gradual development from the rude and primitive to the delicate and refined. An elaborate and truly remarkable technique, however, is manifested in such consummate works of archaic Greek art as the bearded bronze head found on the Acropolis, or the similar head of Zeus from Olympia. The art of hollow casting in bronze, long known in Egypt, seems to have been brought to Greece by Samian artists, and by the end of the Sixth Century was adopted for larger works. Ægina early attained fame for its artists in bronze, of whom Onatas was the chief, and the influence of this technique, with its sharp lines and fine engraving, is plainly seen in the marble sculptures of the Æginetan temple. The new art came to be regarded as more noble than the cutting of marble, and was especially cultivated in the Argive and Sicyonian schools.

To the period under discussion belongs another development in metal-work, namely, the minting of coins. The earliest coins, properly so called, seem to date from about the beginning of the Seventh Century B.C., and to have been struck by the Lydian monarchs (possibly first by Gyges). Their material is electrum, or "white gold," a native alloy of gold and silver, in about the proportion of three to one. Phidon of Argos, a tyrant of uncertain date, but not earlier than the Seventh Century, is said to have been the first to issue coins among the Greeks, Ægina being the seat of their mintage, and the name "tortoises" being bestowed upon them from the figure on the obverse, the reverse (which was the side struck by the upper die in minting) having upon it the familiar "incuse-square," or punch-mark so prevalent in archaic coinage.

In Greece Proper, sprang up, subsequent to the Æginetan, a coinage at Corinth, the so-called "colts," from the Pegasus on the obverse, and at Athens the so-called "maidens," or "virgins," from the Athena-head of the obverse, or "owls" from the type of the reverse. We see in all these types a sacred symbolism, which continues unbroken in coinage till the Macedonian Period.

The greatest Greek cities in this early period were the Achæan colonies of Magna Græcia, foremost among which was Sybaris, afterward overthrown by her great rival Croton. The coinage of the Achæan Confederacy, which seems to have existed in this region, is far superior in artistic workmanship to that of Eastern Hellas, and is distinguished by having, instead of an incuse-square on the reverse, an incuse type, generally the same as that of the obverse (Poseidon, bull, boar, etc.).

Sicilian coinage, notably that of Syracuse, which in the Fifth and Fourth centuries reached so high an artistic position, also began in the Sixth Century.

All the coinage here mentioned, except the Lydian, is of silver. For a full discussion of ancient coins, with exhaustive bibliography, consult Head's *Historia Numorum* (Oxford, 1887); also particularly Percy Gardner's admirable *Types of Greek Coins* (Cambridge, 1883). The period here outlined corresponds to Head's archaic period, B.C. 700-480. See also NUMISMATICS.

The minting of money became gradually diffused through the Greek world, so that there was hardly a town of any consequence without a coinage, some towns being known to us only from their coins.

Intimately connected with die-cutting is gem-engraving, for the details of which see the work of Middleton, *The Engraved Gems of Classical Times* (Cambridge, 1891).

IV. **PERIOD OF HELLENIC PRIME.** The period which we now enter upon is naturally subdivided by that great convulsion of the Greek world, the Peloponnesian War (B.C. 431-404), into an earlier and a later half, in which diverse social and political influences are at work, wherefore it will be of advantage to keep this subdivision in mind. The most noteworthy development of this time for us is that of sculpture and statuary, the great monuments of the painter's art having irretrievably perished. It must be borne in mind that no hard and fast line separates these Greek periods, such as divides the Mycenæan from the later times. The great development in Greek art is indeed later than the Persian wars, but the germs are in the later Sixth Century, and many works, which artistically belong to the archaic period, were made after B.C. 500. The same remark applies to all the later periods; the dates given are merely convenient approximations.

In the early part of this period the development of bronze statuary was continued chiefly by the so-called Argive-Sicyonian School. We find Ageladas of Argos and Canachus of Sicyon famous as statuaries in bronze about the end of the Sixth Century. Gold and ivory (in the famous chryselephantine work) and marble were more popular in Attica, where the quarries of Pentelicus furnished inexhaustible material. Pythagoras of Rhegium (the author of the limping "Philoctetes"), and Calamis and Myron among Attic artists, the latter famed for his "Discobolus" and bronze cow, are the forerunners of "Phidias" in the development of the great art of the Fifth Century. Here also belong the sculptures from the temple of Zeus, at Olympia (q.v.), whose artistic origin has been sought in many schools, perhaps with most probability in Ionia.

Greek sculpture, however, reached its highest ideal development, though not its full legitimate growth, in Phidias (q.v.), son of Charmides, and pupil of Ageladas, of Argos, the superintendent of the Parthenon (q.v.) sculptures, and the artist of the chryselephantine Athena Parthenos, as well as the creator of the highest anthropomorphic type of Greek religion in the great chryselephantine Zeus at Olympia, of whose calm and marvelous beauty and dignity we can now, unfortunately, gain but feeble conception.

We have noticed Phidias's activity in connection with the Parthenon, but we must not leave unmentioned the other great buildings of the time, the Propylæa, the so-called Theseum, the Erechtheum, the temple at Eleusis, and that at Rhamnus, while a like architectural activity was going on across seas in Ionia, Sicily, and Magna Græcia.

Painting as a great and independent art was developed contemporarily with Phidias, by Polygnotus, of Thasos, whose paintings in the *Lesche* (portico) at Delphi have been fortunately described to us by Pausanias. He must have powerfully influenced the art of the ceramic painters, as we seem to be able to trace in their works. After him may be mentioned Agatharchus, of Samos; Apollodorus, the first painter of pictures in the more modern sense (i.e., on flat, movable surfaces, anciently not of canvas, but of board); Zeuxis, the contemporary of Socrates, whose "Centaur Family" is minutely described to us by Lucian, and Parrhasius, of Ephesus.

The work of the Argive-Sicyonian School was carried forward by Polyclitus (q.v.). He was the author of the Doryphorus (spear-bearer), and Diadumenus (youth binding on head-band), which are known to us through Roman copies; and he established a canon of proportion characterized by a certain squareness and heaviness.

After the stormy period of the Peloponnesian War we find Cephisodotus and Praxiteles (q.v.), probably his son, carrying out Greek plastic art to its legitimate and logical conclusion, and to fullest bloom and perfection. The "Eirene" (Peace) with the baby "Plutus," preserved in Munich, a replica of a work of Cephisodotus, is a gracious and lovely figure; but Praxiteles's marble "Hermes," with the baby "Dionysus," found in the place designated by Pausanias, the Heræum at Olympia, in exquisite sensuous beauty, in perfection of manly strength and grace, and in the combination of the divine ideal with human form, as well as in complete mastery of technique, surpasses all that is left us of ancient art, while the pensive expression of the god's face indicates but too clearly the speculative thought that was undermining the old faith. There is no more perfect image of the period than this marvelous statue. It is to Praxiteles that we are to attribute the development, if not the invention, of languid but not yet effeminate figures, with hand supported on hip, such as the famous "Faun," of which several replicas exist, perhaps even the torso of the original. Praxiteles is preëminently the sculptor of youthful beauty, not merely in man but also in woman, as proved by his famous "Cnidian Aphrodite," inadequately preserved in replicas.

Side by side with Praxiteles must be mentioned Scopas (q.v.), of Paros, whose art was rather that of the Peloponnesian School, while Praxiteles is Attic. The remains of his work from the temple of Athena Alea at Tegea, though scanty, make it possible to recognize his style in a number of other sculptures, such as the Meleager, the Ares Ludovisi, and a head of the youthful Heracles. These show distinctly his power in "tragic intensity of expression."

To the last half of the Fifth and first half of the Fourth Century we may assign those most exquisite funereal monuments of the Athenian Ceramicus, such as that of Dexileos, and the deeply pathetic relief of Hegeso. The early reliefs show decidedly the influence of Phidias, while later the work of Scopas evidently became the model. Indeed many archæologists are disposed to see the actual work of this master in some of the best of these monuments.

Portraiture also began in this period with Silanion, and from this time probably date the beautiful Lateran Sophocles, and some of the types of Socrates and Plato. Heretofore the statues set up in honor of men had been ideal in their type rather than a portrayal of the real features of those honored.

The growth of the Attic drama in the fifth century led to the architectural development of the theatre, though most of the buildings known to us belong at the end of this period, or early in the next. For a consideration of the form and development of these structures, see **THEATRE.**

In ceramics we must consider the Attic development, which in this period is of absorbing interest, and gives us much light on painting on a larger scale, as well as on contemporary manners and customs. The rise of Attic black-figured ware has already been mentioned. As a special form of this we must mention particularly the fine Panathenaic amphoras, with figures of the armed Athena, in which the sacred oil was presented to victors at the Panathenaic games. These vases are interesting as being continued in an archaistic form into the Fourth Century (cf. Baumeister, *Denkmäler*, art. Panathenaia). A special class of peculiarly Attic vases are the beautiful white *lecythi* (oil or perfume flasks), which were interred with the dead, and which contain scenes from the burial, and also from the daily life, exquisitely depicted in colors on the white slip with which the body of the vase is covered. The series begins early in the Fifth Century, and continues during the Fourth, in the variations of style throwing much light on the development of painting, and forming an interesting parallel to the contemporary series of grave reliefs.

In the "red-figured" ware, which far surpasses in artistic merit the black-figured, and of which the rise as a separate variety has already been mentioned, scenes from the myths, while not excluded, yet make room for delightful bits of social and domestic life. In the development of this style the "cylix," or shallow cup on a rather high foot, plays an important part, especially in the early part of the Fifth Century, when such masters flourished as Euphronios, Duris, Hiero and Brygos. See Hartwig, *Griechische Meisterschulen* (Stuttgart and Berlin, 1893).

Various grotesque forms of vases, such as the rhyton (in the shape of a head, generally that of an animal), later came into use, and we find numerous examples of the pyxis, or woman's toilet-box. But the art gradually sank, and vase-painting was fast dying out at the beginning of the Alexandrian Period.

In the domain of numismatics we must briefly mention the periods of transitional art (B.C. 480-415) and of finest art (B.C. 415-336). We have here not to deal particularly with Athenian coinage, which, like the Panathenaic amphoras, keeps a designedly rude and archaic character in order to maintain its position with foreign peoples, with whom the Attic State came in contact through its wide maritime relations and commercial dealings, but rather with such beautiful work as that of the Syracusan die-cutters Eusænetus and Cimon, in the period subsequent to B.C. 415, whose splendid decadrachms are justly reckoned among the highest achievements in this class. We may trace, however, through the coins of this entire epoch that same gradual mastery of material and development from the more severe to the more graceful, which is marked in other lines of art. But coinage still maintains the sacred symbolism which characterized it from the beginning, the purely human and individual element appearing distinctly only in the special marks of magistrates and mint-masters, which are kept subordinate to the main design.

V. PERIOD OF HELLENIC DISSEMINATION AND DECLINE.—The development of Macedon under Philip and the conquests of Alexander change the entire aspect of the Greek world. We have henceforth to consider a Hellenism synonymous with civilization rather than the geographical Hellas with her outlying colonies.

In Greece itself the greatest influence is exerted at the opening of this period by Lysippus of Sicyon, who not only continued the prestige of the Argive-Sicyonian school, but also introduced a new canon in statuary, making the figure more slender and the head proportionally smaller than in the preceding art and forming a marked contrast to the canon of Polycletus. His work is known to us from copies of his "Apoxyomenos" (a youth scraping himself with the strigil); and a marble copy at Delphi of a series of statues of the family of Daochos, of which the bronze originals were at Pharsalia. He was also a sort of court-sculptor to Alexander the Great, as Apelles was his painter. His influence extends immediately to Rhodes in Chares of Lindus, one of his best-known pupils, and artist of the famous "Colossus of Rhodes."

The splendid "Victory of Samothrace," now in the Louvre, which may be dated about the beginning of the Third Century, is one of the greatest monuments of this period, and deserves to be ranked with such splendid figures as the "Victory of Pæonius of Mende," set up at Olympia a century or more earlier, and with the Victories from the balustrade of the Temple of Athena Nike, at Athens.

The Pergamene art, cultivated especially under the Attalid kings, and of which we see such astonishing examples in the frieze of the great altar of Zeus at Pergamon (q.v.), of the earlier part of the Second Century B.C., representing a colossal gigantomachy, exhibits great mastery of technique, violence of action, and the free expression of physical suffering, the two latter being qualities of sculpture rather than of painting. Somewhat earlier than the great altar are the well-known statues of the "Dying Gaul" (miscalled "Gladiator"), and the Gaul and his wife in the Ludovisi Gallery. As intimated above, it is the grand finale of Greek sculpture, in which this art still appears great, though overstepping its due bounds. To this period also belongs probably the development of the Rhodian School, though some scholars prefer to date the great product of that school, the Laocoön group, now in the Vatican, at the end of the Second Century or beginning of the First Century B.C. To this school in its Asiatic development belongs the great work of Apollonius and Tauriscus of Tralles, the "Farnese Bull."

Single statues which seem to belong to this period, but cannot be assigned with certainty to any definite artist, are the "Aphrodite of Melos," one of the most beautiful works of the later classical art; the "Apollo Belvedere" (q.v.); and the "Torso of the Belvedere," a noble fragment, whose correct restoration, though often attempted, has not yet been found. To this period also belongs the full development of genre scenes, though this begins still earlier. Such are the group of the "Boy and the Goose," the "Drunken Old Woman," the "Fisherman," and especially the large mass of reliefs, which seem to owe their origin to Alexandria, and to be the product of the same tendencies which led to the bucolic poetry. Portraiture also flourished, not only in statues and busts of the living, but in ideal portraits of the great men of the past, as Homer and Anacreon.

With the painting of the Alexandrian Period we come more closely into contact than with the earlier art in this kind through the wall decorations of Herculaneum, Pompeii, and Rome, which follow the traditions of this epoch. Apelles (q.v.) of Colophon represents the highest development of Greek painting. His idealized portraits of Alexander were as famous as Lysippus's statues. Protogenes of Caunus, who worked at Rhodes about the end of the Fourth Century, is also distinguished in this department. Antiphilus at the court of Ptolemy is characterized as "most eminent in facility." But the list of great Greek painters closes with Theon of Samos, of the Third Century (cf. the article "Malerei," in Baumeister, op. cit.).

In other species of art we find the eminent gem-engraver Pyrgoteles, employed by Alexander; and this branch of the sculptor's profession, ever excessively popular among the ancients, was fostered by that monarch's successors.

In vase-painting we note little else than decline, the latest development manifesting itself in Magna Græcia, Etruria, and Campania. The painted vases of southern Italy, which present a distinctly funereal element side by side with a marked influence from the drama, give us much valuable archæological material. Asteas (of Pæstum?), Pytho, and Lasimus are its only masters known to us by signature. We have also some Campanian vases with Latin inscriptions of the Third Century. The end of vase-painting seems to fall about the beginning of the Second Century B.C.

We may here depart from our chronological order to consider briefly the peculiar ware of Etruria (q.v.), when, side by side with primitive geometric pottery, continued seemingly over a long period, and more or less skillful imitations of Greek painted ware (particularly Attic), we find the so-called *vasi di bucchero,* a peculiar class of pottery of black clay, about which we have but little exact knowledge and of which examples have been found not merely in Etruria, but also in the Orient, in Cyprus, in Greece proper, and on the coasts of the Black Sea. The earliest of such vessels in Etruria are made without the potter's wheel, but in the manufacture of the later (and darker) ware, this tool was employed. The earliest figures are scratched in; subsequently relief-decoration appears. In the latter case, Greek types are employed, at first roughly, afterwards more skillfully and with a mold or incised roller. In individual cases polychrome painting occurs. This art seems to have continued into the Sixth Century.

Before leaving the subject of pottery we must also notice the so-called Samian and Megarian relief-ware, assigned to the Third and Second centuries B.C., and the Aretine ware, apparently of the First Century B.C. and later.

In numismatics the new development under Alexander and his successors, designated as "the period of later fine art from the accession of Alexander to the death of Lysimachus" (B.C. 336-280), and marked by the influence of Lysippus, is succeeded by a period of decline in art extending to the Roman conquest (B.C. 280-146). Types of sovereigns, first that of the deified Alexander, then those of other and living princes, make their appearance upon coins, and continue down to the later Roman Empire a valuable series of historical portraits. Gold coinage now begins to occupy a prominent position, and continues side by side with silver and bronze to be a medium of exchange under the Roman Empire.

In small art our attention is particularly drawn to the terra-cotta figurines of this period, particularly those of Tanagra in Bœotia, which in their charming shapes and lovely coloring give us so many delightful pictures of Greek life. Such figures have their origin in very early times, but from the time of Praxiteles, whose style they often reproduce, down to the Roman period and later, they formed a favorite household decoration, and were buried in great numbers with the dead. See TERRA-COTTA.

Bronze mirrors may also be alluded to here before we pass out of the domain of Greek classic art. Of these some most beautiful specimens exist, their lids forming a class of *chefs-d'œuvre* in metal-graving, while their handles are often statuettes of finest workmanship.

VI. ROMAN PERIOD. The passion of the Roman connoisseurs for objects of Greek art has already been alluded to; but in the period upon which we are now entering certain other elements demand our attention. As among the Greeks, the introduction of foreign art was met by a native element, which at first colored and afterwards completely overpowered by the strength and vigor of its own development external influences; so we find in Italy, among the Etruscans, the masters, in so much, of the Romans, and whose peculiar bucchero-ware has already been mentioned, a native element which reacted upon the art from without, though in a much slighter degree than that of Greece and with inferior genius. Their art was not the oldest in Italy; for we find specimens of *situlæ* (pails) of beaten metal, perhaps to be designated as Umbrian, the decoration of which, while it seems to show certain elements derived through the Greeks, has but little affinity with Etruscan art.

The influences at work among the Etruscans were principally Greek, as we have noticed in the case of their figured pottery. The native elements were chiefly their sombre religion, and a marked aptitude for portraiture. We find "realism combined with poverty of style." The chief Etruscan monuments are funereal, consisting of decorated tombs, sarcophagi, and ash-urns, in which Greek ornamentation and Etruscan portraiture are not very happily blended.

The same tendency to portraiture appears among the Romans, fostered by the importance attached to ancestral *imagines* (portraits in wax), which played so marked a part in their funeral ceremonies. Their masters in this were Etruscan artists.

Hand in hand with the art of plastic portraiture, in which Roman artists learned from Etruscan masters, went that of honorary statuary in bronze, and after the Second Punic War such statues were to be seen at Rome in large numbers, most Romans of any distinction being honored in this way. It was just after this time that their Grecian conquests began to bring the Romans decidedly under the sway of Hellenic art.

In architecture the markedly Roman feature is the great employment of the arch, which, although not unknown to the Greeks, was but rarely used by them. This rendered possible such great works as the aqueducts, to say nothing of the Colosseum, the Pantheon, and the other huge structures of imperial times. In temple construction we find Etruscan influence at work in the earlier period, in both form and decoration. Later Greek architecture is combined with native elements in elaborate and luxuriant structures.

The so-called Attic Renaissance in sculpture about the beginning of the period we are now considering, i.e. when Greece had been brought under Roman dominion, introduced no new elements, but carried on with enfeebled ability the old. This revival is best known to us through the "Farnese Hercules," an exaggerated work of which the motive is derived from Lysippus.

The school of the First Century B.C., founded by Pasiteles, a native of southern Italy, and continued by his pupil Stephanus, and Stephanus's pupil, Menelaus, deserves mention as exercising somewhat of independent influence. It is characterized by a return to the types and style of the end of the archaic period, but combines them with types and technique belonging to its own time. During this period we also find the growth of the archaistic style, which imitated the stiff drapery, awkward smile, and other peculiarities of the archaic art.

The most active class of sculptors at Rome in the time of the late Republic and early Empire were from Asia Minor. Best known among such is Agasias, the artist of the so-called "Borghese Gladiator."

From the time of Augustus on, we meet, side by side with a vast importation of ancient Greek works and reproductions of them in copies, a host of portrait statues and busts, triumphal arches and elaborate public and private buildings of all kinds. A most splendid specimen of Roman portrait-statuary is that of Augustus in general's uniform, now in the Vatican. In it are admirably combined grand and realistic portraiture and rich decorative effects, particularly in the cuirass. Especially noteworthy also are the reliefs of the Ara Pacis Augusti and of the triumphal arches, such as that of Titus. In these fields of portraiture and historical relief, the art of Roman times offers much that shows originality and strength, but in general it is imitative of the Greek. Consult: Wickoff, *Roman Art*, translated by Eugénie Sellers Strong (London and New York, 1900).

Of idealistic bronze statuary we have a beautiful example in the "Victory of Brescia" of the First Century A.D.

The era of Hadrian is the last period of vigorous impulse in art among the Romans. That Emperor's passion for ancient art, both Egyptian and Greek, and his encouragement of new works, both at home and abroad, is well known. To his reign are to be assigned the various idealized portraits of his famous Bithynian favorite Antinoüs.

In numismatics the last period of continued decline (B.C. 146-27), that of the coinage of the Roman Empire down to Gallienus (B.C. 27 to A.D. 268), falls in here. The material is vast; and here, too, the element of realistic portraiture is prominent.

The luxury of the Romans manifested itself in the multiplication of elaborate mosaics, rich jewelry, wonderful intaglios, both in stone and in paste, costly glassware and the like. But of all this art, which cannot be fully discussed here, suffice it to say that it involves no new principles. It is merely the bloom of that decay which was fast consuming the ancient world.

Further information concerning single branches of archæological research is presented under the titles of ancient countries. The articles on these countries include the art, monuments, language, religion, laws, etc., of the early inhabitants. Among such articles are: Assyria; Babylonia; Egypt; Phœnicia; China; Japan; Persia; Ceylon; and India. For information with regard to the arts of ancient countries, the reader is referred to the series of special articles on Assyrian Art; Babylonian Art; Egyptian Art; Bible Antiquities; Chinese Art; Japanese Art; Indian Art; Anglo-Saxon Art, etc. More specific information about discoveries at particular places is included under the titles of those places—as, for example, Karnak; Koyunjik; Persepolis—and under the names of the excavators, such as Botta; Ledyard; Pétrie; Peters; Mariette; Maspéro, etc. See further the articles on Agriculture; Aqueduct; Architecture; Armies; Navies; Brick; Building; Costume; Cuneiform Inscriptions; Glass; Hieroglyphics; Numismatics; Rosetta Stone; Amarna Letters. For biblical archæology, in addition to the general title, see Atonement, Day of; Baal; Dagon; Essenes; Festivals; Judges, Book of; Levites; Magic; Nazirite; Priests; Proselyte; Purim; Rémphan; Rimmon; Sabbath; Sacrifices; Sadducees; Scribes; Tabernacle; Tammuz; Temple; Teraphim; Urim and Thummim; Vows.

ARCHÆOLOGY, American. In many respects the Western Hemisphere forms a distinct archæologic field, and one of peculiar interest to the student. In the first place the two great continents, with their insular appendages, form a single ethnic province, i.e., from the earliest times up to Caucasian discovery, the lands were inhabited by the single tribe or race of mankind known as the Amerind, or American type; and though the province is vast, yet throughout its extent the tribes and their works bear what may be called the family resemblance in a striking degree. In the second place, the American aborigines, from the Arctic to the Antarctic, were remarkably similar in cultural development. True, some of the tribes discovered by Caucasians represented lower savagery, while others (as in Mexico and Peru) occupied the higher planes of barbarism verging on civilization, yet the cultural range represented by their works is narrower than that of any other ethnic province save Australia. Furthermore, the aboriginal tribes survived until the spirit of inquiry among the European invaders of the Continent had been developed, and until observation and records were well advanced. By reason of the several conditions, a distinctive, if not a novel, science of archæology has grown up in the Western Hemisphere. In the American system, prehistoric artifacts are interpreted in the light of the observed uses of artifacts, recorded by early explorers or studied by modern investigators; the modern artifacts are interpreted in the light of primitive thought ascertained by current inquiries into primitive arts, industries, laws, languages, and faiths—and thus the ancient and the modern, the prehistoric and the historic, the living and the dead are correlated in a simple yet comprehensive scheme at once coextensive with the world's greatest ethnic province and sufficiently definite to outline a considerable part of the course of human development.

The object matter of American archæology comprises (1) human remains imbedded in natural deposits or entombed in prehistoric structures, and (2) artifacts in wide variety, including (a) habitations, (b) mounds and other structures connected with habitations or places of worship, (c) gaming devices, (d) tools, implements, and weapons, (e) ceremonial objects, (f) domestic and ceremonial utensils, (g) shrines and monuments, (h) petroglyphs, (i) moldings in stucco, (j) sculptures, (k) miscellaneous inscriptions, (l) wrought metal objects, etc. The various artifacts may be grouped under a few general designations based on prevailing types such as earthworks, stone implements, pottery, etc.

Human Remains. Bones of prehistoric men are exceedingly common in the mounds and other burial places of central and eastern United States; skeletons, with and without integument, have been found in caves throughout nearly all of both Americas, and are fairly common in the arid districts; and complete mummies of prehistoric bodies, with complete wrappings, have been found in large numbers, especially in Peru. The chief lesson taught by these remains is that the prehistoric inhabitants of the various districts (so far back as this record runs) corresponded more or less closely, in most cases exactly, with the tribes found there by Caucasian explorers, the correspondence extending to the mode of burial, the preparation of the body, and the mortuary sacrifices, as well as to the somatic or physical characteristics of the individuals. In some cases diversities between the living and the dead have been found of such sort as to indicate migrations or displacements of tribes, and in a few instances these have thrown useful light on early movements of the aborigines; but in a general view, these indications are of minor importance. By some students, numbers of prehistoric crania have been grouped by types—e.g. dolichocephalic and brachycephalic—assumed to represent distinct genetic stocks or races; but since the types merge in very large series, since both are sometimes found in the same mound or cemetery (and even in the same living clan), the value of the cranial classification would seem but secondary at the best. In some instances the prehistoric skeletons, especially the crania, throw light on customs; thus the Muniz collection of 1000 Peruvian crania, of which 19 were trephined in 24 distinct operations, proves that the prehistoric folk of this region performed this critical operation with a frequency higher even than that of a modern military hospital, and with a degree of success hardly exceeded by that of the best modern surgery. Similarly the distribution of deformed crania throws light on cradle customs and on the half-intentional flattening of infantile heads in prehistoric times; while the pathologic conditions occasionally revealed by the buried bones serve to extend our knowledge of certain diseases and wounds, and of the medical practice of the early tribes.

In a few instances human bones have been found in such associations as to suggest the high geologic antiquity of man in America. The best-known instance is that of the Calaveras skull alleged to have been found in auriferous gravels beneath lava beds near Angels, Cal.; and its interest was enhanced by frequent reports of the finding of stone implements (pestles, mortars, spear-heads, etc.) in gravels of a corresponding age. At the time the associations were reported, the gravels were supposed to be Pleistocene or Quaternary, and the lava still newer, so that the accounts had an air of credibility. During 1880-95, several geologists resurveyed the region, and ascertained that the auriferous gravels, and even the overlying lava-beds, are of Tertiary (probably early Tertiary) age, so that the alleged associations would seem unworthy of consideration unless supported by the strongest possible direct evidence. In 1897 the region was reexamined critically by Holmes and McGee, who discovered (1) that all the alleged occurrences of human relics in the gravel reported during recent years may be ascribed to a natural misapprehension on the part of workmen and others (the objects falling from the surface into the gravel stratum, to mix with the pebbles in the sluice boxes); (2) that most of the mortars and pestles alleged to have been found in the gravels were manufactured from the volcanic rock overlying the gravel beds; (3) that the obsidian blades reported from the gravels are made from material of much newer formations; (4) that the Calaveras skull is of a type corresponding precisely with that of Indians still living in the same vicinity; (5) that its state of preservation corresponds closely with that of modern bones after a few years' burial in the limestone caverns or calcareous earths of the region; and (6) that the contemporary testimony concerning the finding of the cranium is contradictory, with the burden against the original allegation. Other reports of the occurrence of human remains in geologic deposits have come from Trenton; the first case was that of a supposed Eskimo cranium, alleged to have been found in Pleistocene deposits, but which was afterward examined by Russell and found to be of modern Algonquian type; another was a human femur reported from the same deposits, which is yet under discussion. On the whole it may be said that while the prehistoric human remains of America throw much light on ethnic problems, on the habitats and migrations of tribes, on primitive customs, and so on the later chapters in the development of the aborigines, they throw little light on such questions as those relating to the origin and antiquity of mankind.

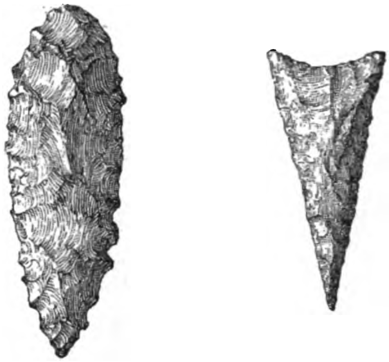
Earthworks. The most conspicuous prehistoric works of America are mounds and other elevations of earth, such as occur abundantly in the Mississippi Valley; perhaps the best-known examples being Cahokia Mound, near East Saint Louis, and the Etowah Mound in northeastern Georgia. The mounds range from barely perceptible elevations to two hundred feet in height, from three to four yards to over half a mile in diameter, and from a hundred square feet to several acres in extent; they number tens, if not hundreds, of thousands; and while they are most abundant in the neighborhood of the Mississippi and its tributaries, they occur in every State and Territory of the United States and in every American country and district thus far adequately examined. Many, if not most, of the simple mounds are tumuli or burial places; a considerable part of those examined have been found to contain human skeletons, sometimes in large numbers, together with a wide variety of artifacts attesting lavish mortuary sacrifices. In some instances structures of wood or stone have been found in the mounds; and in southwestern United States, Mexico, Yucatan, Honduras, and some South American countries, many of the mounds are but ruins of habitations, temples, or other structures reduced by weathering. In some districts the tumuli are associated with embankments, either simple or in circular or rectangular form; and these are sometimes combined and connected with conical or pyramidal mounds in elaborate systems. Squier, whose investigations of the aboriginal earthworks of the Ohio Valley are classic, deemed the earth-built circles accurate and the squares perfect; and while later surveys have revealed imperfections in the engineering, the extent and symmetry of the works must be regarded as remarkable. In some cases the earthworks have been shown, by early observation or otherwise, to be designed as fortifications; but similar evidence indicates that many of the most remarkable works were ceremonial, and connected with elaborate systems of faith and forms of worship. In Wisconsin, Minnesota, and Iowa, and to some extent elsewhere, many mounds are rudely shaped in animal forms, representing various mammals, birds, and reptiles; these effigy mounds denoted the totems (or zoic tutelaries) of local clans and tribes. One in Wisconsin, known as "the Elephant Mound," from its resemblance to the elephantine form, has attracted much attention, though it is the prevailing opinion of investigators that the resemblance is fortuitous; but perhaps the most remarkable example of its class is "the Serpent Mound" of Summit County, Ohio, described by Putnam, and through his efforts preserved in a public park. Along most or all of the American coasts shell-mounds, or middens, occur, sometimes in great size and profusion. Those of the Maine coast have been examined by many investigators, and have been found to consist primarily of shells, bones, and other refuse of a shoreland dietary, together with implements, utensils, and ornaments lost in the débris from time to time, so that they afford a clear picture of prehistoric life; and similar records have been obtained from the middens of Alaska, British Columbia, California, Greenland, and other parts of the North American coast. The shell mounds of Florida yielded a remarkably clear record under the investigations of Wyman; and this record was greatly extended on the western coast of Florida by Cushing, who found the coastwise keys and other small islands raised and strengthened by carefully laid walls of conch and other shells, and who obtained from adjacent muck-beds remarkable series of utensils, ornaments, ceremonial objects, etc., preserved in the peaty mass in remarkable perfection. The shell mounds of the Louisiana coast also are of great extent, though they have not been fully examined; while Moore and others have found those of the Alabama coast to throw much light on local characteristics of the aborigines. Perhaps the largest American shell mound is that forming Punta Antigualla, opposite Tiburon Island in the Gulf of California; it is about ninety feet high, and although a large but unknown portion of it has been carried away by wave-wear, it still covers an area of some seventy-five acres; it is wholly of local shells, chiefly those of the clam, and contains pottery and stone implements precisely like those used by the surviving aborigines of the district, from base to summit.

The origin of the custom of building mounds has been discussed by Cushing; he conceived the original mound to be a midden of shells and other refuse accumulated under a shoreland pile-dwelling to such height as eventually to form a support for the habitation; and that the association of mound and dwelling eventually became so deeply fixed in the minds of the dwellers that when new habitations were erected further inland, the mound was regarded as a necessary accompaniment, and was built of earth in lieu of refuse. During the earlier two-thirds of the Nineteenth Century the opinion prevailed that the "Mound Builders" were a distinct people or race, antedating the Amerind tribes found inhabiting the country by the Caucasian invaders; this was shown, chiefly by Powell and later by Thomas, to be an error. The latter described the earthworks of the eastern United States in detail, and identified many of them with the aborigines residing in their vicinity up to the time of white settlement. The demonstration of the identity of "Mound Builders" and "Indians" may be said to have been completed by Holmes, who in various publications established the unity of æsthetic, technic, and symbolic motives in the mounds and among the living tribesmen. The mound proper, with its variants in the form of embankments, effigies, etc., may be regarded as pertaining to humid lands, and the shell-mounds to shorelands; while in arid lands the earth-working sometimes differentiated into a style of house-building known in parts of Spanish America as *cajon* (so called from the box-like arrangement of parallel boards between which puddled earth was laid and allowed to harden in successive ledges, or strata, varying from a few inches to a foot or more in vertical thickness); and this type of structure is widely diffused in the more arid regions of both American continents, the best example in the United States being the ruin known as Casa Grande (q.v.), near Florence, Ariz. Modernly the *cajon* structure grades into adobe—i.e., sun-dried bricks of puddled silt; but there is some question whether the use of adobe proper ("dobies" in the vernacular) antedated the Caucasian invasion. From *cajon* to a plaster of earth and stone over wicker walls was an easy step, which was taken by many tribes, as attested by buried ruins of the arid region as well as by vestiges among living tribes, e.g., the Papago; and the step thence to wrought stucco was little harder, and was taken by the ancient Mexicans, Yucatecans, Central Americans, and some South Americans, as well illustrated in several ruined cities (noted under ARCHITECTURE, ANCIENT AMERICAN).

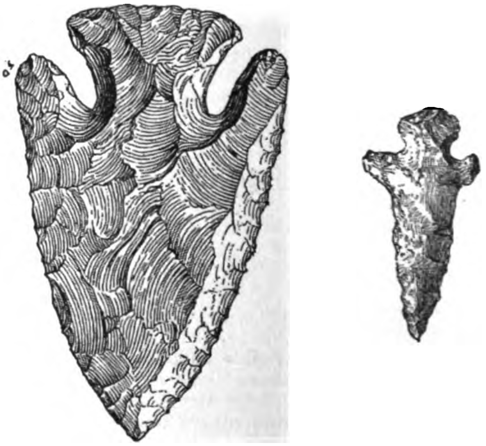
WOODEN STRUCTURES. While wood was undoubtedly used largely by the prehistoric tribes of America for habitations as well as for implements, utensils, etc., comparatively little of the material remains for study. In certain large tumuli described by Thomas, remains of wooden structures were found under such conditions as to indicate that earth was heaped over a house or stout wigwam in such manner as to form a lofty mound; the stumps of prehistoric piles, probably used either to support palafittes (or pile dwellings) or as adjuncts to large fish weirs, were found by Cresson in Delaware River, near Clay-mont; in the prehistoric Casa Grande of Arizona, as well as in neighboring pueblos of prehistoric origin, upper floors and roofs were supported on joists and rafters consisting of round cedar or pine poles, which must in some instances have been transported over many miles of desert from the wooded mountains; in even the most imposing and massive temples of Yucatan and Peru, wooden lintels were introduced—and the decay of these was one of the factors in hastening the downfall of these noble structures. These instances of the use of wood are quite in accord with the large employment of this material among the tribesmen found by the first invaders; and the two records—unwritten and written—coincide not only as to the use of the material, but as to the primitive modes through which it was reduced to serviceable condition by aid of crude stone tools and fire. Closely connected in aboriginal thought with the fixed home was the floating habitation, also commonly of wood or bark; the greater water-craft, capable of navigating all parts of the Caribbean Sea and Gulf of Mexico, are known through the descriptions of Columbus and his companions, as well as from models found by Cushing in the peat-beds of western Florida; while fragments of birch bark from the mounds of Wisconsin, and bits of cane from the great shell-mound of Seriland, are among the indications that the pre-Columbian warrior paddled the light canoe or propelled the graceful balsa just as do his descendants of the fifteenth generation.

STONE STRUCTURES. More or less extensive ruins of stone structures, the work of aborigines during prehistoric times, occur in many districts throughout the Western Hemisphere; they range from simple cairns of loose pebbles to imposing temples of wrought stone. The types are too numerous for easy listing; but several examples throw light on the technic of the ancient artisans. Thus most of the pueblos and cliff-dwellers of the southwestern United States and northern Mexico are of coarse rubble—i.e., of natural slabs laid with slight regard to the production of even surfaces. Some of the ancient walls are of slabs finished off on one or both edges by smooth jointage planes so selected and laid as to form surfaces hardly less regular than cut stone; while Hodge, in 1899, found in New Mexico certain stone ruins in which the walls were evidently smoothed by rubbing or grinding after the structure was otherwise complete—the corners in one case being neatly squared and in another beautifully rounded to a radius of several inches. Yet even these fine structures showed that the primitive mason did not grasp the principle of breaking joints or that of the mortar-bond. In Central Mexico and Yucatan massive stones were laid in substantial walls; but even here, as shown by Holmes, the quarrying and dressing were effected wholly with stone tools and by painfully clumsy methods, while none of the builders grasped the principle of the arch. Much the same may be said of the remarkable stonework of Peru. The architectural features of American stone structures (so far as architecture was developed in the Western Hemisphere) are described elsewhere; but it is worthy of special note that the many-storied pueblo grades into the cliff-house, and this again into the cavate lodge dug into the softer stratum of the cliff, and this in turn into the simple rock shelter, the open cavern used for temporary lodgment by primitive folk everywhere. It may be noted also that the early Americans used stone structures chiefly for habitations and places of worship, and seldom, if ever, for fortresses. True, rude fortifications of loose rubble crown hilltops adjacent to villages in Wisconsin and northern Mexico, as noted by Bandelier and described by McGee under the local designation *trincheras*, while similar fortifications have been observed in other districts; yet even these are places of ceremonial observance as well as of defense—and true fortifications of stone are conspicuously absent from the greater part of America.

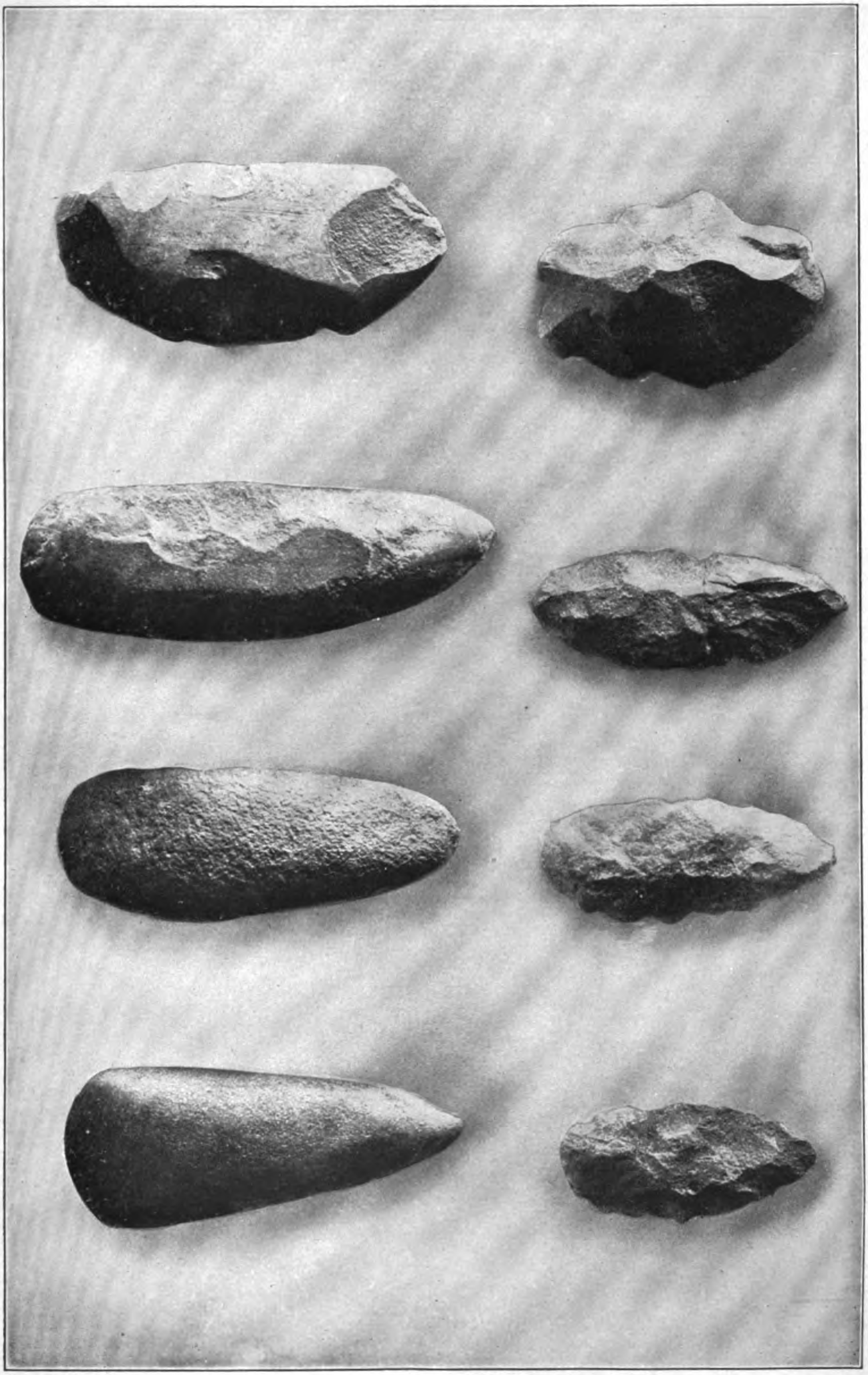
STONE IMPLEMENTS. The diversity between the archæology of America and that of Europe culminates in the classification of stone implements and the definition of culture-stages based on this classification. This diversity arises naturally in the modes of approach, that of America being through observation of primitive customs, and that of Europe through the logic of the civilized mind. On both hemispheres stone implements are numerous—commonly the most abundant relics of the prehistoric period; on the American hemisphere they are still in use, in aboriginal fashion, by a considerable class of the population. Throughout the eastern United States aboriginal arrow-points of stone may be found on nearly every hillside, while larger implements, which may have been used as spear-heads or knives, can be picked up in every township. Usually



FLINT ARROW-POINTS, FROM TENNESSEE.



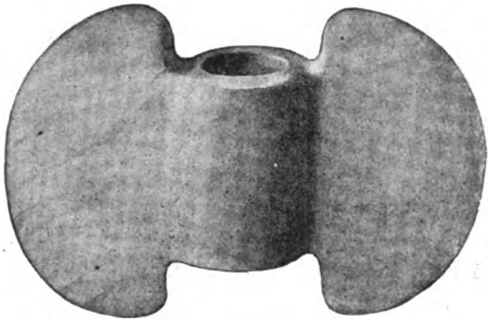
ARROW-POINT AND PERFORATOR.



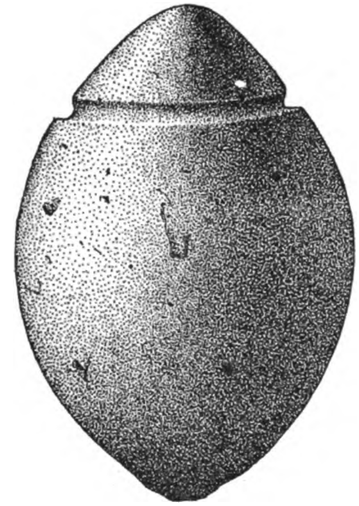
STAGES IN MANUFACTURE OF CELTS FROM RIVER PEBBLES. Ranging from partially chipped pebble to finished implement, from near Luray, Virginia.

STAGES IN MANUFACTURE OF CHIPPED IMPLEMENTS FROM QUARTZITE COBBLES. Ranging from "Turtle Back" or "Paleolith" to arrowpoint, from District of Columbia.

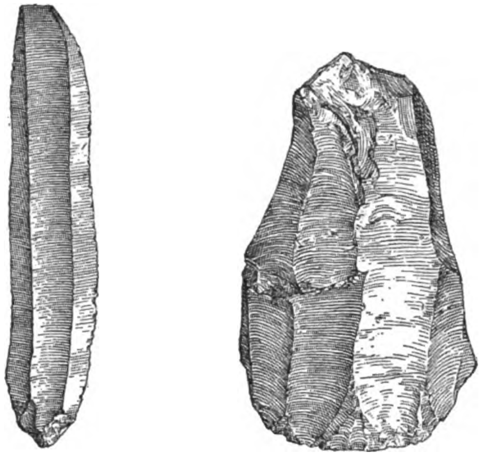
they are rather rudely chipped from quartz, quartzite, argillite, or other local or neighboring rocks; and Holmes in Maryland, Fowke in Virginia, Mercer in Pennsylvania, and Phillips in Illinois, have traced the material to its original sources, and have described the quarries and workshops whence the implements came—indeed, the first of these investigators has been able to trace the distribution of given materials from particular quarries, and has thus been able to throw light on aboriginal migrations and commerce. Associated with these implements are found vessels of steatite (soapstone), elaborately wrought stone pipes of material ranging in hardness from steatite to quartz, and a great variety of gorgets, pendants, etc., of polished stone, as well as stone disks, such as were used by the aborigines in games up to the time of the white settlement. These various types of stone artifacts have been found on the surface in tumuli associated with skeletons, in shell-mounds on hundreds of village sites, and about scores of quarries and quarry workshops; and both the certain relations that are found to prevail among prehistoric artifacts and the observation of living peoples indicate that the flaked, chipped, and polished objects were made at the same time and by the same tribes—indeed, scores of specimens bear the unmistakable traces of manufacture by a combination of processes ranging from flaking and chipping, to battering, grinding, and polishing. Toward the Pacific coast the stone implement types are much the same, though their relative abundance is different; chipped arrow-points and spear-heads are comparatively rare, while polished stone pestles and mullers are abundant, associated with equally abundant mortars, either portable, or shaped in natural ledges and great bowlders; while here, as in much of Mexico, and to some extent in the Pueblo country, blades of beautifully flaked and chipped obsidian (volcanic glass) are frequently found in ancient mounds and graves, as well as in the possession of aged shamans among the living tribes. Some of the California tribes noted by Powers make little



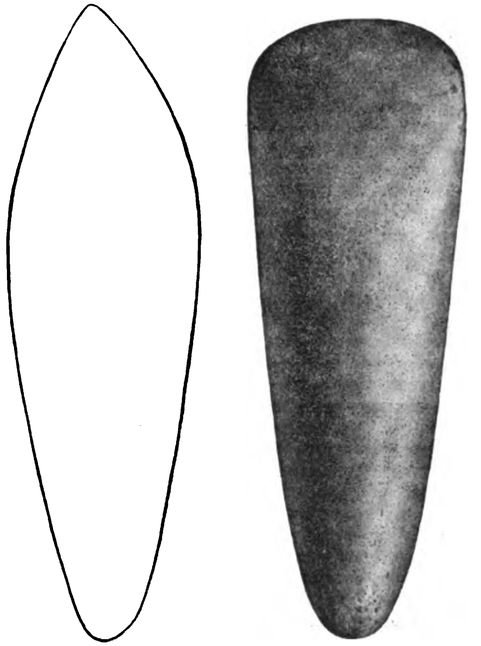
EMBLEMATIC GORGET, FROM RHEA COUNTY, TENN.



PLUMMET, MADE OF SANDY LIMESTONE, FROM LOUISIANA.

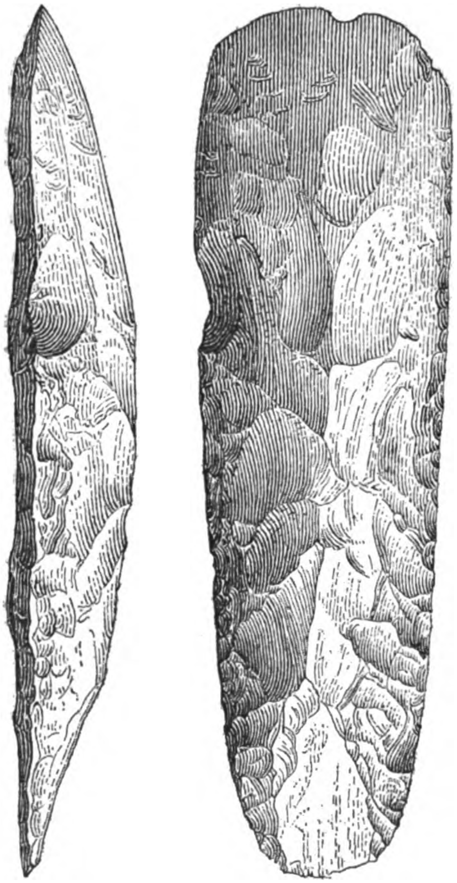


FLINT CORE, FROM WHICH FLAKES WERE CHIPPED, AND FLINT FLAKE USED AS A KNIFE.



TYPICAL POLISHED CELT (SIDE VIEW AND SECTION). FROM LINCOLN COUNTY, ARKANSAS.

use of stone for cutting, etc., though they employ natural pebbles, so cleft as to give sharp edges, for certain purposes; while the Seri Indians of Tiburon Island use wave-worn cobbles for breaking up green turtles, large game animals, etc., and gradually reduce them by wear to symmetric form and well-polished condition, yet eschew them with horror if accidentally broken in such a manner as to form sharp edges.



CELT, ROUGHLY CUT BY CHIPPING, AND FINISHED BY GRINDING. FROM ALEXANDER COUNTY, ILL.

The various types of stone implements, both prehistoric and modern, grade in some respects into implements of shell, tooth, bone, and wood; and the method of interpretation in terms of primitive thought, affords a means of classifying the entire series of implements in simple and instructive fashion. Thus it is found that the lowest peoples give preference to tooth and bone, to chitinous beak and claw, to sharp-edged shell and piscine spine, as material for tool and weapon, and, moreover, that they prefer to use these materials in a manner mimetic of the actual or imputed motions of their zoic tutelaries; so that this stage of culture has been regarded as primal, and defined as zoömimic. It is found also that the somewhat more advanced savages give preference to stone used in natural forms, to which zoic attributes are imputed (as when pebbles are designated as teeth), and gradually shape and polish these by the wear of use, without antecedent design; and this stage of designless stonework is defined as protolithic. In like manner it is found that the more advanced tribes shape their implements first by a combination of wear like that of the previous stage, later by battering and chipping, and last of all by flaking, in accordance with preconceived designs; and the implements so produced, and the culture-stage which they represent, have been defined as technolithic. This classification is set forth elsewhere (MAN, SCIENCE OF) in some detail; but it is desirable to note that the classification is based largely on prehistoric material, while, conversely, it illumines in useful fashion a considerable part of the course of cultural development on the Western Hemisphere.

METAL PRODUCTS. Large numbers of metallic artifacts have been found in the mounds of the eastern United States, in the cemeteries of the arid region, in the crypts of Mexico, and in the *huacas* of South America. The prevailing material, especially in North America, is copper, evidently found native and wrought cold, or at low heat, with implements of stone, deer horn, etc. Most of the copper objects are implements evidently designed in imitation of stone celts, axes (tomahawks), spear-heads, knives, etc.; while many objects, usually wrought from sheets, were evidently decorative or ceremonial, some of the largest pieces from the mounds being zoic images, or effigies, evidently of totemic character. In the Pueblo region, and thence southward through Mexico to Bolivia and Peru, silver and gold were used in considerable quantity, ordinarily for decorative or symbolic purposes; these metals, too, were undoubtedly found native, and wrought (usually) at low temperatures; but a few interesting types of gold ornaments, described by Holmes, were evidently produced by partial fusing of slender bars or wires, while some objects seem to have been produced by a sort of casting, in which the metal must have been fused, at least to a moderately fluent condition. Some of the mounds have yielded ornamental pieces of iron, evidently of meteoric origin, and wrought cold or at low temperature; their preservation being due to the resistance of siderite to oxidation, and their shapement depending on the fact that this material is "hot-short," yet malleable at low temperatures. There are a few examples (including one brought to light in the neighborhood of Casa Grande, Arizona, in 1898) of the aboriginal use of heavy masses of iron; the Casa Grande specimen was a circular plate of fairly symmetrical form, some two feet in diameter, and nearly two inches in thickness; the material was greatly oxidized and disintegrated, but bore some appearance of meteoric origin. On the whole, the metallic artifacts of prehistoric America indicate that the aborigines never mastered smelting, and that most of their standards of metal-working were borrowed from their more characteristic stone craft.

FICTILE WARE. Next in abundance to stone implements among the relics of ancient America is pottery; it may be found in sherds and smaller fragments in every commonwealth, if not in every county of the United States, in every State, if not every district, of Mexico, and in equal abundance throughout most of Central America and South America, as well as in some abundance over much of Canada. In general, the prevalence of fictile ware in the domestic economy of the various tribes was inversely proportionate to (1) basketry, (2) gourds, (3) shells, (4) woodenware (often shaped in imitation of shells), (5) horns of buffalo, musk ox, etc., and (6) birchbark, etc.; yet so far as the relics go, they indicate that the prevailing utensils of pre-Columbian America were of fictile ware. The ware varies widely in quality, from rude inch-thick ware to delicately shaped, artistically painted and semiglazed bowls and vases; while in the Mississippi Valley, the Pueblo region, Mexico, Central America, Peru, and to some extent elsewhere, elaborate figures of symbolic and ceremonial character were wrought in clay, and fired with a skill little short of that of the Old World. By Cushing and others, the genesis of the pottery bowl has been traced to the basket, the germ appearing when a flat basket was lined with earth for use in parching corn (by mixing the grain with hot coals and shaking them within it); and this interpretation has been measurably verified by the finding of sherds, and some entire pieces bearing the impress of the baskets in which they were molded in certain mounds and cemeteries. The molded and painted designs on aboriginal ware have received much attention, notably from Holmes and Fewkes; they have been found to be symbolic, and in many cases susceptible of interpretation as totemic emblems, etc. Closely related to the fictile ware, and especially to the figurines, is the stucco work of Central Mexico, Yucatan, Honduras, Costa Rica, and other districts. These stucco designs, which have been carefully studied by Saville, Holmes, and many other students, are sometimes of calendric character, and are related on the one hand to the stone sculptures of the same districts, and on the other hand to the native books, or codices, inscribed on maguey paper. Viewed collectively, the fictile ware of pre-Columbian America is of interest as marking, in many respects, the highest intellectual advancement of the Western Hemisphere; for the better grades, at least, represent well-developed æsthetic standards, fair technical skill, a highly differentiated religious symbolism, and the germ of writing. Yet it is to be remembered that even the finest products of the American claypit and kiln were but earthenware rather than porcelain or delft, and that both the potter's wheel and true glazes were unknown to its makers.

INSCRIPTIONS AND CODICES. The early travelers and settlers in many parts of America found designs inscribed or painted on trees and rocks; and throughout the more mountainous portions of the Western Hemisphere, petroglyphs (usually formed by battering the rock-face with a harder stone, but sometimes sharply incised) are numerous and striking. These rude inscriptions grade into the sculptures and stucco moldings of Mexico and Peru, as well as into the designs molded and painted on the fictile ware; at the same time they are related to the inscriptions of the maguey codices which were found in great numbers by the Conquistadores, but were sacrificed under hasty ecclesiastic impulse before their value was understood—all save the few specimens looted by subalterns or privates, and sent surreptitiously to Europe as souvenirs of personal success. The various aboriginal records are not only alike in general character, but tell a consistent story of intellectual advancement on the part of the earliest Americans; and their testimony is corroborated by modern observation of the autographic records of tribesmen in many districts. On putting together the various records, it appears that none of the pre-Columbian aborigines had grasped the idea of arbitrary characters, but were satisfied with crude symbols understood only by themselves, or conventions understood by special classes only (like the figurines on the wampum treaty belts, each recalling a clause or item in the vaguely remembered contract); and that even the most elaborate inscriptions were little more than sacred calendars designed to control ceremonial observances, and understood only by the priests. Accordingly, the inscriptions attest a germ of writing, yet prove that the germ remained largely inchoate up to the coming of Columbus, and the introduction of incomparably higher intellectual standards. True, the North American Indian Sequoyah invented a syllabary which aided his kind in their strife for intellectual advancement and which might have developed a written language; but there is some question as to whether his invention was not stimulated by European suggestion.

HUMAN ANTIQUITY. The archæologists of America, like those of other countries, are in constant search for evidences of human antiquity, and hundreds of suggestive observations are on record. On generalizing these, it must be said that none of the acceptable observations indicate an antiquity of man on the Western Hemisphere at all comparable to that indicated by apparently trustworthy observations in Europe and Asia. Briefly, there is a strong presumption that mankind existed in North America about, if not anterior to, the last ice invasion of the Pleistocene, i.e. ten thousand to fifty thousand years ago; yet positive evidence is far from complete, as indicated by the fact that not a single reported association of human remains with even the latest Pleistocene deposits is unquestionably accepted by either anthropologists or geologists.

PRE-COLUMBIAN DISCOVERIES. There have been many suggestions of discoveries of America anterior to the time of Columbus, by both Europeans from the East and Asians from the West; some of the latter are particularly striking, and are now under critical examination, partly through an admirable series of expeditions supported by Jesup, directed by Putnam, and conducted by Boas and others. The most striking indications of pre-Columbian discovery falling clearly within the domain of archæology are the cairns, house remains, and stone pavements of eastern Massachusetts, which have been described and compared with the Norse structures of Iceland and Scandinavia by Miss Horsford. The case cannot, perhaps, be considered closed, pending inquiries in related lines; but it is important to note that some of the works on Charles River —in the Vinland the Good of the Sagas—are unlike those produced by any known native tribe, and are like those of the Norse settlers in Iceland.

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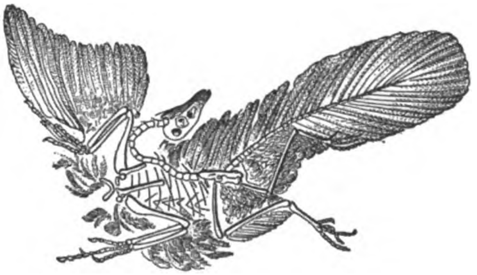
ARCHÆOPTERIS, ăr′kė-ŏp′tė-rĭs (Gk. ἀρχαῖος, *archaios*, ancient + πτερίς, *pteris*, fern). A genus including some of the oldest known fossil ferns, originally described by Dawson in 1863 to include species from the Chemung group of the Upper Devonian. The leaves are bipinnate with obovate inequilateral pinnules; the fertile leaves having oval spore-cases instead of pinnules. Perhaps the largest species is *Archæopteris Jacksoni*, fine examples of which, attaining a length of five feet, are often found in the flagstone quarries of the upper horizons of the Catskill group in the central portions of the Catskill Mountains of New York. See FERN; CARBONIFEROUS SYSTEM; DEVONIAN SYSTEM.

ARCHÆOPTERYX, ăr′kė-ŏp′tė-rĭks (Gk. ἀρχαῖος, *archaios*, ancient, primitive + πτέρυξ, *pteryx*, wing, bird). The oldest known bird, found fossil in the Jurassic lithographic stone of Solenhofen, Bavaria, where it was discovered in 1861. It was a creature about the size of a crow, bird-like in form, having a rather short, blunt beak, the upper jaw of which was furnished with thirteen teeth, and the lower with three teeth on each side, each planted in a separate socket. Its most extraordinary feature, however, is a lizard-like tail of twenty vertebræ, from each of which springs a pair of well-developed quill feathers. "The vertebræ of the neck and back were biconcave, the sternum seems to have been keeled, and the manus had three free digits. The tibia and fibula do not coalesce, and the former was furnished with a series of feathers (wing-quills) very similar to those of the tail." These are divisible, as in modern birds, into primaries and secondaries. That it was able to fly is not to be doubted; the form of its feet, also, indicate arboreal habits, and that it scrambled about, as well as made short flights, is suggested by the fact that each finger of the hand, as well as the toes, was armed with a claw. The tail must have impeded rather than assisted flight, and it is interesting to note that in later birds this cumbersome member soon became modified into substantially the present form before the Cretaceous era came to a close. (See BIRDS.) It was first thoroughly studied by Owen (*Philosophical Transactions*, London, 1863); later information is summarized in Newton, *Dictionary of Birds*, Article "Fossil Birds" (New York, 1893-96).



ARCHÆOPTERYX MACRURA.
(Specimen from Solenhofen, studied by Owen.)

ARCHA′IC (Gk. ἀρχαϊκός, *archaikos*, old-fashioned, primitive, from ἀρχή, *archē*, beginning, origin). A term applied to the primitive stage of the art of a good period, especially to Greek art before Pericles. *Archaistic* is applied to an imitation of this style; as, when Greek artists under Augustus reproduced Greek sculpture of the Sixth and Fifth centuries.

ARCHAN′GEL, or **ARKHANGELSK**, ăr-kăn′gĕlsk. A government of Russia, between 61° and 71° N. lat. and 28° to 66° E. long., extending along the White Sea and Arctic Ocean from Finland and Norway east to the Ural, and bounded on the south by the governments of Vologda and Olonetz. It occupies an area of 331,640 square miles, including the islands of Nova Zembla and Vaigatch. It is the largest government of the Empire, and occupies the entire north of European Russia. Its greatest length, from west to east, is 900 miles; its greatest width, from north to south, is 132 miles. Four large navigable rivers flow through Archangel; the Petchora for 528 miles, the Onega 132 miles, the northern Dvina 265 miles, and the Mesen 265 miles, all emptying their waters into the White Sea. The northwestern and the northeastern parts are mountainous, reaching a height of more than 4900 feet. The climate of Archangel is very severe in the central part of the government. At its northwestern extremity the climate is perceptibly milder, and the open sea is never frozen. The great wealth of Archangel is in its forests, which cover more than half of its area. Lumbering is therefore the leading industry. The inhabitants are besides engaged in agriculture which, at its best, in the south is but poorly developed, in fishing and hunting along the shores of the Arctic and the White Sea, and in the rearing of deer, which constitutes the almost exclusive occupation of the Samoyeds. The population of the government was 331,200 in 1890, and 346,536 in 1897. Ninety-eight per cent. of the people are Russians. Of the different aboriginal tribes, as the Lopars, Zyrans, Samoyeds, etc., there are not more than 6000 persons. Archangel is the most sparsely populated government of Russia. Consult A. P. Englehardt, *A Russian Province of the North* (Westminster, 1889).

ARCHANGEL. The capital city of the Russian Government of Archangel, situated in lat. 64° 33′ N., and long. 40° 33′ E., on the right bank of the Dvina River, 26 miles above its entrance into the White Sea, and 740 miles northeast of Saint Petersburg (Map: Russia, F 2). It is the largest and most important city in the world situated so near to the Arctic Circle. The city is of ancient origin, and among its most noteworthy buildings is the handsome cathedral finished in the beginning of the Nineteenth Century. It is said to be the handsomest and best-lighted cathedral in Russia. The other buildings of interest are the bazaar or mart, the marine hospital, and the wooden "little house" of Peter the Great. The importance of the city is considerable, since it serves as an outlet for the products of the far northern and western part of Siberia. The chief articles of traffic are fish, skins, furs, timber, wax, iron, tallow, bristles, and caviar. At its annual fair, in September, about 14,000,000 rubles worth of goods change hands. The value of its exports and imports amounts to about 8,000,000 rubles ($4,500,000) annually, and it is visited by some 800 vessels during the months of July to September, the only period of the year when the harbor of Archangel is entirely free from ice. Of the foreign vessels visiting the port the British and Norwegian are the most numerous. Considerable inland shipping is carried on by a large number of smaller vessels navigating the Dvina. The fact that the harbor is ice-bound during the greater part of the year has been the greatest obstacle to the commercial growth of the city. The site was visited in 1553 by the English expedition under Chancelor in search of a northeast passage to India. An English factory was erected soon after. The origin of the town dates from 1584, when a fort was erected. Pop., 1897, 20,933.

ARCHANGEL (Gk. ἀρχι, prefix denoting dignity of rank + ἄγγελος, messenger, angel). A term occurring twice in the New Testament, I. Thess. iv. 16 (referring indefinitely to an exalted angelic being), and Jude 9. The idea contained in the term is due to the Old Testament development of the conception of angels, which, in its earliest stage, involved nothing more than the positing of supernatural beings, whose vocation, generally speaking, was to be in varied ways agents of God. Gradually, however, the idea of moral distinctions among these angelic beings appeared, some of them being thought of as doing evil, as when in Gen. vi. 1-4, the 'sons of God' are spoken of as being led into a love for the 'daughters of men,' and some of them being pictured as instigating men to wickedness, as in I. Chron. xxi. 1, where Satan is represented as moving David to number Israel. Finally, among the hosts, in which more or less they had been understood as existing, appeared the idea of ranks and even names, the book of Daniel referring to Gabriel (viii. 16; ix. 21) and to Michael, who is represented as "the great prince who standeth for the children of the people" (xii. 1). Both of these developed ideas—moral distinctions and ranks and names—are carried over into the New Testament writings, where use is frequently made of them. The first place in these ranks is evidently intended to be referred to in our term. See ANGEL.

ARCHANGEL, NEW. See SITKA.

ARCHANGELICA, ärk'ăn-jĕl'ĭ-kȧ. See ANGELICA.

ARCHAS, är'kas. A character in Fletcher's *The Loyal Subject;* a much too "loyal subject" of the unworthy and thankless monarch in that play.

ARCHBISHOP, ärch'bĭsh'ŭp (Gk. ἀρχι-, *archi-*, chief + ἐπίσκοπος, *episkopos*, overseer). The title given to a metropolitan bishop who superintends the conduct of the suffragan bishops in his province, and also exercises episcopal authority in his own diocese. The archbishop was probably originally the bishop of the chief town. The office appears as early as the Fourth Century. In the Oriental Church the archbishops are still called 'metropolitans,' from the circumstance mentioned. In the African Church, on the other hand, the term used was 'primus.' The great archbishoprics of the early Church were those of Jerusalem, Antioch, Ephesus, Alexandria, Constantinople, and Rome. Since the Sixth Century the Archbishop of Rome has borne the name of Pope (*papa*). There is an official letter by Justinian, addressed to "John, Archbishop of Rome and Patriarch," and several ecclesiastical constitutions are addressed to "Epiphanius, Archbishop of Constantinople and Patriarch." The Synod of Antioch, in 341, assigned to the archbishop the superintendence over all the bishoprics and a precedence in rank over all the bishops of the Church, who, on important matters, were bound to consult him and be guided by his advice. By degrees there arose, out of this superiority of rank, privileges which at length assumed the character of positive jurisdiction in ecclesiastical matters. Many of these rights passed to the patriarchs (q.v.) toward the end of the Fourth and during the Fifth Century, and still more to the Pope in the Ninth. The archbishops still retained jurisdiction, in the first instance, over their suffragans in matters which were not criminal, and over those who were subject to them they acted as a court of appeal. They possessed also the right of calling together, and presiding in, the provincial synods; the superintendence and power of visitation over the bishops of the metropolitan see; the power of enforcing the laws of the Church; the dispensation of indulgences, and the like. The archbishops further enjoyed the honor of having the cross carried before them in their own archiepiscopate, even in presence of the Pope himself, and of wearing the *pallium*.

In the Established Church of England there are two archbishops, both appointed by the sovereign, of whom the one has his seat at Canterbury, the capital of the ancient kingdom of Kent; the other at York, the capital of Northumbria. But though, as ruling over a province in place of a single diocese, both have enjoyed the rank of metropolitans from the first, the Archbishop of Canterbury has all along enjoyed, not merely precedence as the successor of Augustine and the senior archbishop, but as possessing a preëminent and universal authority over the whole kingdom. This preëminence is marked in the titles which they respectively assume—the Archbishop of Canterbury being styled the Primate of All England (*metropolitanus et primus totius Angliæ*), while the Archbishop of York is simply called Primate of England (*primus et metropolitanus Angliæ*). It is also indicated by the places which they occupy in processions—the Archbishop of Canterbury, who has precedence of all the nobility, not only preceding the Archbishop of York, but the Lord Chancellor being interposed between them. Previous to the creation of an archbishopric in Ireland the authority of the Archbishop of Canterbury extended to that island. The amount of control which belongs to an archbishop over the bishops of his province is not very accurately defined; but if any bishop introduces irregularities into his diocese, or is guilty of immorality, the archbishop may call him to account and even deprive him. In 1822, the Archbishop of Armagh, who is Primate of All Ireland, deposed the Bishop of Clogher on the latter ground. To the Archbishop of Canterbury belongs the honor of placing the crown on the sovereign's head at his coronation; and the Archbishop of York claims the like privilege in the case of the Queen-Consort, whose perpetual chaplain he is. The province of the Archbishop of York consists of the six northern counties, with Cheshire and Nottinghamshire. The rest of England and Wales form the province of the Archbishop of Canterbury. The dioceses of the two archbishops—that is to say, the districts in which they exercise ordinary episcopal functions

—were remodeled by 6 and 7 Will. IV. c. 77. The diocese of Canterbury comprises Kent, except the city and deanery of Rochester, and some parishes transferred by this act; a number of parishes in Sussex called 'peculiar'; with small districts in other dioceses, particularly London. The diocese of the Archbishop of York embraces the county of York, except that portion of it now included in the dioceses of Ripon and Manchester; the whole county of Nottingham, and some other detached districts. In Ireland there are two Protestant archbishops, elected by their fellow-bishops out of their number, and four Roman Catholic. Of the former, the Archbishop of Armagh is Primate of All Ireland; the Archbishop of Dublin being Primate of Ireland. They formerly sat alternately in the House of Lords; the three bishops who, along with them, represented the Church of Ireland, being chosen by rotation.

The Roman Catholic Church in England and Wales has one archbishop; in Scotland two archbishops, while the Episcopal Church in that country has no archbishop, but a *primus*. An English archbishop writes himself, "by divine providence"; a bishop being, "by divine permission"; and an archbishop has the title of "Grace," and "Most Reverend Father in God," while a bishop is styled "Lord," and "Right Reverend Father in God." The archbishop is entitled to present to all ecclesiastical livings in the disposal of diocesan bishops, if not filled within six months; and every bishop, whether created or translated, was formerly bound to make a legal conveyance to the archbishop of the next avoidance of one such dignity or benefice belonging to his see as the archbishop should choose.

The only archbishops in the United States are those of the Roman Catholic Church, now fourteen in number. Up to 1789 the ecclesiastical government of that Church in this country continued under the vicar apostolic of the London district, the local superior at that time being Father John Carroll, of Baltimore. In 1789 Baltimore was erected into an episcopal see, and Father Carroll became bishop. In 1808, after New Orleans, New York, and Boston had been erected into sees, Baltimore was raised to metropolitan rank, Father Carroll becoming the first archbishop, as he had been the first bishop, in this country. The dates of the establishments of other archiepiscopal sees in this country are as follows—the first date being that of the foundation of the see, and the second of its elevation to a metropolis: Oregon City, 1846, 1846; Saint Louis, 1826, 1847; New Orleans, 1793, 1850; New York, 1808, 1850; Cincinnati, 1821, 1850; Dubuque, 1837, 1893; San Francisco, 1853, 1853; Milwaukee, 1844, 1875; Boston, 1808, 1875; Philadelphia, 1808, 1875; Santa Fé, 1850, 1875; Chicago, 1844, 1880; Saint Paul, 1850, 1888.

ARCHDALE, ärch'dâl, JOHN. A colonial governor of North Carolina, born in England. He came to New England, as the agent for Governor Gorges, of Maine, in 1664; was a commissioner for Gorges (1687-88); and was Governor of North Carolina, of which he was also a 'proprietary.' He reorganized the administration of the colony, conciliated the Indians, and introduced the culture of rice. He published *A New Description of the Fertile and Pleasant Province of Carolina, with a Brief Account of Its Discovery, Settling, and Government up to This Time* (London, 1707).

ARCHDEACON, ärch'dē'kŭn (Gk. ἀρχι-, *archi-*, chief + διάκονος, *diakonos*, servant, minister of the Church). An ecclesiastical dignitary whose jurisdiction is immediately subordinate to that of the bishop. The archdeacon originally was simply the chief of the deacons, who were the attendants and assistants of the bishop in Church affairs. His duties consisted in attending the bishop at the altar and at ordinations, assisting him in managing the revenues of the Church and directing the deacons in their duties. From being thus mere assistants, archdeacons in the Fifth Century began to share the bishop's powers, and step by step attained to the authority they now enjoy, which from the Ninth Century became in many respects distinct from that of the bishop. Several synods protested against the innovation, but it was continued in the Eleventh and Twelfth centuries, when the archdeacons were recognized as the most influential of prelates. In the Thirteenth Century, their powers were limited by the establishment of episcopal courts. Their dignity and influence is now very much reduced in the Roman Catholic Church, and many of their former functions are now exercised by vicar-generals.

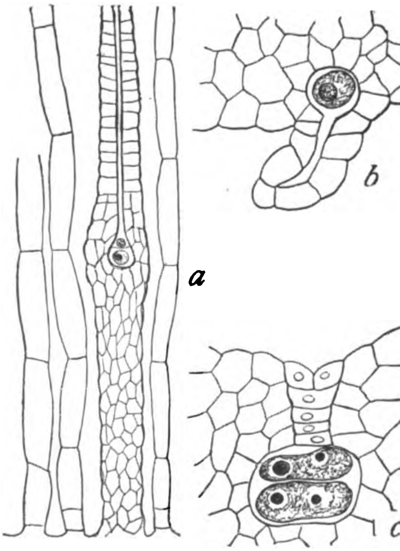
There are now eighty-three archdeaconries in the Established Church of England. No person can be appointed to this office who has not been six years a priest. His duties include visitation of the parishes, holding synods, ordering repairs of churches, and in other ways being, as the canon law calls him, 'the bishop's eye.' He is addressed as 'Venerable.' In the American Protestant Episcopal Church the archdeacon exercises analogous functions, but the office is found in only thirty-nine out of the seventy-six dioceses, and the number in the dioceses where it has been introduced varies from one to six. The office is found in all branches of the Church of England and also in the Lutheran Church.

ARCHDUKE, ärch'dūk' (*arch* + *duke*, from Gk. ἀρχι- *archi-*, chief + Lat. *dux*, leader). Archduke and archduchess are titles now taken by all the princes and princesses of the house of Austria. The title seems to have originated about the middle of the Twelfth Century, though it came into use only gradually. Rudolph IV. of Austria called himself Palatinus Archidux. The name was formally conferred on the Hapsburgs by Frederick III. in 1453. Various noble houses, especially that of Bavaria, disputed the title with the Hapsburgs, but since Rudolph II., German Emperor from 1576 to 1612, their precedence has been established.

ARCHEDEMUS, är'kē-dē'mŭs (Gk. 'Αρχέδημος, *Archedēmos*), called GLAMON (the 'blear-eyed'). A demagogue and popular speaker in Athens at the end of the Fifth Century and the beginning of the Fourth Century B.C. He is said to have been a foreigner who worked his way by fraud into the Athenian franchise, was poor, and was generally disliked by reason of his restless activity and meddlesomeness. By bringing an accusation against Erasinides, he took the first steps toward the impeachment of the Athenian generals who took part in the battle of Arginusæ, B.C. 406.

ARCHEGONIUM, är'kē-gō'nĭ-ŭm (Gk. ἀρχέγονος, *archegonos*, first of a race, primal). The peculiar female organ of mosses, ferns, coniferns, etc., which together are often spoken of as Archegoniates. It is a flask-shaped organ, consisting of a *neck* more or less elongated and a *venter* more or less bulbous. A single egg occupies the venter, and in the process of fertilization the sperm enters by the open neck of the archegonium and comes in contact with the egg. Among the mosses the archegonium is a free and often stalked organ. Among the liverworts the archegonia are variously disposed on the thallus-body, while in mosses they are borne in a cluster at the apex of the leafy shoot or of its branches, the terminal rosette of more or less modified leaves forming what is often called a 'moss flower.' Among the ferns the archegonia are usually borne upon the under side of the inconspicuous sexual plant (prothallium), the venters being imbedded in the tissue and the necks more or less projecting. In the water ferns, quillworts, and little club-mosses, the female plant is developed as a tissue within the spore, whose heavy wall breaks or cracks at a certain place, and in the exposed part of the female plant the archegonia are developed. Among the conifers the spore, with its contained female plant, is retained within the ovule, and hence the archegonia are not exposed, but lie imbedded in the superficial part of the female plant (endosperm), toward the micropyle (the passageway left by the integument). Among the conifers the male cells are brought to the archegonium by growing pollen-tubes. The pollen-grain, containing the male cells, rests at the base of the micropyle, upon the apex of the nucellus (central part of the ovule). The tube penetrates the tissue of the nucellus and reaches the embryo-sac (megaspore), just within which are the archegonium necks. It then pierces the sac-wall, enters and crushes the neck, and discharges its male cells into the egg.

Among the flowering plants no archegonia are developed, the embryo-sac containing a free egg, along with other free cells of a much-reduced female plant.



ARCHEGONIA.

(*a*) of a moss, (*b*) of a fern, and (*c*) of a liverwort, showing in each case the neck and the venter containing the egg.

The development of an archegonium and its preparation for fertilization are matters of great morphological interest. It begins as a single superficial cell of the sexual plant. By repeated cell divisions the layer of cells constituting the neck and venter is formed, and this surrounds a single row of axial cells. The cells of this row (variable in number) which lie within the neck are called the "neck canal cells," while the lowest cell of the row, the one within the venter, forms the egg. When the archegonium is nearly mature the row of neck canal cells breaks down and leaves an open neck; and usually just before fertilization the cell in the venter cuts off a small cell toward the neck called the "ventral canal cell," which rapidly disorganizes and leaves the egg free and alone in the venter, ready for the approach of the sperms through the neck.

One of the interesting facts in connection with archegonia is that the apical neck cells secrete a substance which attracts the sperms toward them. For example, this substance is not the same in mosses and ferns, so that even if archegonia of the two groups are close together the moss sperms and the fern sperms will be attracted only to their own archegonia.

ARCHEGOSAURUS, är′kê-gô-sa̤′rŭs. See STEGOCEPHALIA.

ARCHELAUS, är′kê-lā′ŭs (Gk. **'Αρχέλαος**, *Archelaos*).—(1) One of the Heraclidæ who, when driven by his brothers from his native land, fled to Macedonia and founded the town of Ægæ. He was the mythical founder of the royal house of Macedonia.—(2) A Greek philosopher and pupil of Anaxagoras. He was born at Athens, and was the son of Apollodorus or Myson. The outlines of his system were those of his teacher, but for the details of his cosmology he went back to the ideas of the earlier Ionic physicists. He admitted a primitive matter, consisting of infinite particles similar in nature to the bodies formed from them. He also admitted a ruling Mind. Matter and mind he held to be mingled, and identified the primitive matter with air. Out of this air, thus endowed with mind, there arose, by processes of thickening and thinning, cold and heat, or water and fire—the former passive, the latter active. From the action of fire and water were formed the atmosphere and the mud out of which the heavenly bodies were developed. Living organized beings, at first of low type, sprang from the mud, and gradually the races of animals were formed. Man he held to be superior to other beings, by reason of his artistic and moral powers.—(3) King of Macedonia, natural son of Perdiccas II. He came to the throne in B.C. 413, after murdering the rightful heir. Archelaus improved the internal condition of his kingdom, introduced changes in the currency, improved the army, and showed himself a warm patron of art and literature. Euripides, Zeuxis, and other men of eminence visited his court, and only Socrates refused an invitation to go thither. The palace of Archelaus was adorned with magnificent paintings by Zeuxis. Archelaus was either murdered or accidentally slain by his favorite, Cratæus or Crateras, in B.C. 399.—(4) A distinguished general of Mithridates. In the winter of B.C. 88-87 he was sent to Greece with a large fleet and army to oppose the Romans in that quarter. On the way he seized the Cyclades, together with Delos, and, by granting the latter island to Athens, won over that city to the side of Mithridates. On his appearance in Greece, the Achæans, the Laconians, and the Bœotians at once flocked to his standard. A three days' battle was fought in the neighborhood of Thespiæ, with indecisive result, but Archelaus was forced to fall back upon Athens and Piræus. In the summer of B.C. 87, Sulla landed in Greece and proceeded against Archelaus. After long and hard fighting Athens and Piræus were taken, and Archelaus retreated to Chalcis. Here he was joined by reinforcements from Mithridates, and in March, B.C. 86, met with a crushing defeat at Chæronea. Of 120,000 men that Archelaus led into battle, barely 10,000 reassembled at Chalcis. In the meantime Mithridates sent into Greece a further force of 80,000 men under Dorylaus. With this force Archelaus faced the enemy at Orchomenus in B.C. 85. His army was almost entirely destroyed, but Archelaus himself, after hiding for several days in a swamp, finally escaped to Chalcis. Peace followed, but Archelaus, though innocent, awakened, by his conduct in the negotiations, the suspicions of Mithridates, and was as a result driven to side with the Romans in the second and third Mithridatic wars.—(5) Son of the preceding. He married Berenice, daughter of King Ptolemæus Auletes, in B.C. 56, and ruled over Egypt for the short space of six months during the banishment of Ptolemæus. The usurper lost his life in a battle against Aulus Gabinius, proconsul of Syria.—(6) Grandson of the preceding. He obtained from Marcus Antonius the Province of Cappadocia, which he retained during the reign of Augustus. Tiberius accused him of political innovations and condemned him to death; but he was already old and broken, and he died at Rome soon after his trial, in A.D. 17.—(7) A Greek sculptor, celebrated for his bas-relief representing the 'Apotheosis of Homer,' which was found in the Seventeenth Century on the Via Appia, near Bovillæ. The relief appears to be the votive offering of a poet made for a victory won at a poetic contest. Its time is placed all the way from B.C. 150 to the beginning of the first century A.D. The relief was purchased in 1819 for the British Museum.—(8) Son of Herod, tyrant of Judæa. He succeeded his father in B.C. 4, and maintained his position against an insurrection raised by the Pharisees. His heirship to the throne being disputed by his brother Antipas, Archelaus went to Rome, where his authority was confirmed by Augustus, who made him Ethnarch of Judæa, Samaria, and Idumæa. After a reign of nine years he was deposed by Augustus, on account of his cruel tyranny, and banished to Vienna in Gaul, where he died. His territories were added to the Roman Province of Syria.

ARCHENHOLZ, är′kĕn-hōlts, JOHANN WILHELM, Baron von (1743-1812). A German historian. After service in the army, he gained his discharge at the close of the Seven Years' War, and passed several years in travel, visiting almost all the principal cities of Europe, and supporting himself by authorship. He wrote *Geschichte des siebenjährigen Krieges* (History of the Seven Years' War) (two volumes, 1793), which, when compared with the generally dry style of his German contemporaries, deserves praise on account of its narrative interest. He also wrote *Annalen der britischen Geschichte* (Annals of British History) (twenty volumes, 1789-98), and biographies of Queen Elizabeth of England and Gustavus Vasa of Sweden.

ARCH′ER, BELLE (1860-1900). An American actress, named Arabella S. Mingle, but known as Miss Archer after her marriage in 1880 to Herbert Archer, from whom she was divorced in 1889. She was born at Easton, Pa., and made her début at Washington, D. C., with William Florence in *The Mighty Dollar*. Afterward she appeared in *Pinafore*, *Hazel Kirke*, etc., and for some time played with E. H. Sothern, as Rose in *Lord Chumley* (1888), and in other pieces. She also supported Alexander Salvini, and in Daly's company took the part of Maid Marian in the later productions of Tennyson's *Foresters*. In 1894, after having left the stage for a time, she resumed her career as a star, and afterward was for a while leading woman with Sol Smith Russell.

ARCHER, BRANCH T. (1790-1856). A Texas patriot. He was born in Virginia, where in early life he practiced medicine. In 1831 he went to Texas, took part in the Revolution, and in 1835 presided over the 'consultation' called by the American settlers to consider the subject of independence. During the same year he was one of the three commissioners sent to Washington to solicit aid from the United States. In 1836 he was speaker of the Texas House of Representatives, and from 1839-42 was secretary of war for the new Republic.

ARCHER, FREDERIC (1838-1901). An American organist, born at Oxford, England. He studied music in London and Leipzig, and held musical positions in England and Scotland until 1880, when he was appointed organist of Plymouth Church, Brooklyn, N. Y. Afterward he became conductor of the Boston (Mass.) Oratorio Society, director of Carnegie Music Hall, Pittsburgh, Pa., and in 1899 organist of the Church of the Ascension, Pittsburg. He founded, in 1885, the *Keynote*, which for a time he edited. He published, besides numerous compositions for the organ, a treatise entitled *The Organ* and *The College Organist*.

ARCHER, JOHN (1741-1810). He was born in Maryland and graduated at Princeton in 1760, the first man in the United States to receive the degree of doctor of medicine, that degree coming to him when he graduated at the Philadelphia Medical College in 1768. He was an officer in the army of the Revolution, a member of the Maryland General Assembly, and a representative in Congress from that State for three terms, 1801-07.

ARCHER, WILLIAM (1856—). An English dramatic critic, born at Perth, Scotland. He received the degree of M.A. at Edinburgh University in 1876, and was on the staff of the *Edinburgh Evening News* from 1875 to 1878. He was dramatic critic of the *London Figaro* from 1879 to 1881; was called to the bar at the Middle Temple in 1883, and succeeded Dutton Cook as dramatic critic of the *London World* in 1884—a position which he still held in 1902. Among his works pertaining to the English drama are: *English Dramatists of To-day* (1882); *Henry Irving*, a study (1883); *About the Theatre* (1886); *Study in the Psychology of Acting* (1886); *W. C. Macready*, a biography

(1890). Since 1893 he has published a year-book of dramatic criticisms, made up of his contributions to the *World*, usually under the title, *The Theatrical World*. Archer has gained wide recognition for his translations of Ibsen's dramas and his attempts to popularize them on the English stage. His translation of *The Doll's House* was performed at the Novelty Theatre, London, June 7, 1889, and in 1890-91 appeared Ibsen's *Prose Dramas*, in five volumes. He also translated from the Norwegian Kielland's beautiful *Tales of Two Countries* (1891), and from the Danish a large part of Georg Brandes's *William Shakespeare* (1898). He visited the United States in 1899 to study the stage here. His *America To-day* appeared in 1900, and *Real Conversations* in 1904.

ARCH'ER-FISH. Any of the small spiny-rayed East Indian fishes of the family Toxotidæ. They are said to eject from their mouths drops of water aimed at insects. These, when the aim is good, fall to the water and are seized as prey by the fish. Specifically, the name is applied to *Toxotes jaculator*, which, because of this interesting habit, is often kept in house aquaria in the East.

ARCH'ERY (O. F. *archerie*, from Low Lat. *arcarius*, bowman, from Lat. *arcus*, bow). The use of the bow and arrow is still practiced by enthusiasts as a means for the capture and destruction of game; but its main use to-day, except in a few remote nations, is as a recreation and healthful exercise. The use of the bow and arrow is coeval with man's authentic history; thus Ishmael "dwelt in the wilderness of Paran and became an archer" (Gen. xxi. 20). The archery of Jonathan is specifically referred to in Holy Writ, and Josephus, the Jewish historian, alleges that the bow was considered the most efficient weapon of the Jews. It was deadly in the hands of their conquerors, the Babylonians, who have left many sculptured memorials of their prowess with it. It is not surprising, therefore, to find that their near neighbors, the Persians, cultivated its practice, or that the Scythians carried the lesson of its value to the Greeks, from whom it passed, with the empire of the world, to the Romans. These, in their turn, were vanquished by the superior skill of the archers of the Goths, Huns, and Vandals.

Both as a weapon of the chase and for military purposes, the bow was for centuries most formidable in the hands of the English. With the long-bow they decided the fate of nations, as at Crécy (1346) and Poitiers (1356) and Agincourt (1415). The skill of their hunters and the wonderful feats of their archers have come down to us from many sources. Especially are the ballads rich in incidents of their prowess. One old black-letter ballad, reprinted in Percy's *Reliques*, tells of "Three Archers," one of whom, shooting before the King, split a wand in two at a distance of four hundred yards; and then, not satisfied with this example, tied his eldest son, a lad of seven years of age, to a stake one hundred and twenty yards off, and cleft an apple placed on his head.

In a treatise on martial discipline, by Ralph Smithe, written in the time of Elizabeth, we have a picture of the English archer: "Captens and officers should be skillful of that most noble weapon the long-bow; and to see that their soldiers, according to their draught and strength, have good bowes, well nocked, well strynged, everie strynge-whippe in their nocke, and in the middes rubbed with wax braser, and shutting-glove, some spare strynges trymed as aforesaid; every man one shefe of arrows, with a case of leather defensible against the rayne, and in the same four-and-twenty arrowes, whereof eight of them should be lighter than the residue, to gall or astoyne the enemye with the hailshot of light arrowes before they shall come within the danger of their harquebus shot. Let every man have a brigandine or a little coat of plate, a skull or hufkyn, a maule of leade of five foote in lengthe, and a pike, and the same hanging by his girdle with a hook and a dagger."

In Queen Elizabeth's reign the practice of archery ceased to be a national necessity; yet she was able to offer Charles IX. of France 6000 men, one-half of whom should be archers; and shortly before the beginning of her reign the celebrated scholar, Roger Ascham, who was a lover of all kinds of sport, wrote the classic work on archery, *Toxophilus, or the Schole of Shooting*, in 1545, in which he gave minute directions on attitude and the manner of drawing the bow. It is a very practical book; indeed, one point he makes is worth transcribing even to-day. Young archers, he says, generally fall into the fault of fixing the eye on the end of the arrow rather than on the mark. To obviate this evil he advises them to shoot in the dark by night at lights set up at their proper distances—a very shrewd bit of advice.

England had not a monopoly of skill in archery; even in the Middle Ages the Egyptians, Arabs, and Turks ran them close. Baumgarten, indeed, relates that he saw 60,000 Mamelukes assembled in a spacious plain, who exhibited almost incredible agility in shooting on horseback, shooting arrows while in full career, and mounting and remounting on either side of their horses and shooting time and again, yet seldom or never missing their mark. He even asserts that horsemen shot while guiding two horses, one under either foot, as men ride in a circus, and their arrows found their mark.

So universal, indeed, was the skill in archery before the advent of gunpowder that no country has been discovered in which it was not the chief reliance of the natives in the chase and war. Vasco da Gama found it in the East Indies and Columbus in the West. The Amazons of South America opposed the invading Spaniards with it. It was found by Cabral in Brazil, and in the uttermost solitudes of the Arctic regions it was in use among the Eskimos. Even to-day the pigmy Bosjemen, in the far interior of Africa, bring the mightiest of game to earth with their poison-tipped arrows: a very ancient and widespread practice to which Justin bears witness in the time of Alexander, and Pliny among the Gauls, as well as Vergil and numerous other classical chroniclers.

But the introduction of gunpowder gradually put an end to the use of the bow and arrow, notwithstanding valiant efforts to maintain the ancient traditions. The Rolls of Parliament are full of indications of the gradual falling off of the voluntary practice of archery at the town butts. It was almost unheard of until it came into new life in London in the year 1760 as an exercise conducive to the improvement of health, and as such it met with a very favorable reception—so much so that by 1781 the Royal Toxophilite Society was formed. The almost continuous wars in which Great Britain for the next thirty years was involved put a limit to it; but after the peace of 1813 archery gradually assumed a stronger position, attested even to this day by numerous societies, popular gatherings, and contests. Modern practice in archery is mainly confined to shooting at targets, although a few sportsmen use it for still hunting. The modern targets are set at various ranges, and the concentric rings of gold (in the centre), red, blue, and black and white have a value in counting of 9, 7, 5, 3, and 1, respectively. In America there are annual competitions of the National Archery Association, and other annual contests by the Potomac Archery Association and the Eastern Archery Association. In these there are contests in "double national rounds" of 96 arrows at 60 yards and 48 arrows at 50 yards; "Double Columbia rounds" of 48 arrows at 50 yards, 48 arrows at 40 yards, and 48 arrows at 30 yards; "Double York rounds" of 144 arrows at 100 yards, 96 arrows at 80 yards, and 48 arrows at 60 yards; "Double American rounds" of 60 arrows at 60 yards, 60 arrows at 50 yards, and 60 arrows at 40 yards; "Potomac rounds" of 24 arrows at 80 yards, 24 arrows at 70 yards, and 24 arrows at 60 yards; as well as competitions for the longest flight and team competitions of 96 arrows at 60 yards for men and 96 arrows at 50 yards for women.

The cross-bow, or arbalest, was shorter than the long bow. It was mounted on a stock, and discharged by means of a catch or trigger. This form of archery was chiefly used by the English at the sieges of fortified places and in naval battles. Ultimately its use was, in the reign of Henry VII. (1485-1509), forbidden by law, but continued intermittently for a long time.

Consult: Roger Ascham, *Toxophilus, or the Schole of Shooting* (London, 1868); G. A. Hansard, *The Book of Archery* (London, 1840); E. S. Morse, *Archery, Ancient and Modern* (Worcester, Mass., 1792); T. Roberts, *The English Bowman* (London, 1801); T. Waring, *A Treatise on Archery* (London, 1828).

ARCH'ES, Court of. The court of appeal of the Archbishop of Canterbury, as metropolitan of the province. The name is derived from the ancient place of sitting, which was in the Church of Saint Mary of the Arches, now usually called Bow Church, in London. The judge of the Court of Arches is styled the Official Principal, although he has for several centuries received the additional title of Dean of the Arches. Appeals from judgments of this court are heard before the judicial committee of the Privy Council (q.v.). The Court of Arches is empowered to hear such suits as are sent up to it by letter of request from the consistorial courts of the bishops of the Province of Canterbury after they have issued commissions of inquiry and the commissioners have made their report. The Court of Arches is the only ecclesiastical tribunal which has authority to pass sentence of deprivation against a clerk in holy orders. Since 1875 the judge of the provincial courts of Canterbury and York has performed the functions of official principal of the Court of Arches, under the Public Worship Regulation Act of 1874.

ARCHETYPE, är'kė-tīp (Gk. *ἀρχέτυπος*, *archetypos*; Lat. *archetypum*, a stamp, die, or model). The original design or pattern from which anything is made or copied. In numismatics, an archetype is the standard coin to whose weight, shape, and design all others of the issue must conform. In palæography, the name is applied to an original manuscript from which a number of others are copied, these being then described as constituting a single 'family.' (See Textual Criticism.) In biology, the archetype is an assumed system or structure on which any group of living organisms, whether animal or vegetable, is said to have been made.

ARCHEVITES, är'kė-vīts. A people mentioned in Ezra, iv. 9. If the text is sound, the term must refer to the people of Erech, a city mentioned in Gen. x. 10, whose inhabitants were deported to Samaria by "the great and noble Asnappar"—i.e., Ashurbanipal (B.C. 668-626)—possibly because they had united with Babylon in the revolt of Shamash-shumukin, as Ryle suggests. But it is not impossible that the text in Ezra iv. 9 has suffered in transmission, and originally read "who were Cuthæans," as II. Kings xvii. 24 mentions people deported "from Babylon and from Cuthah."

ARCHIANNELIDA, är'kĭ-ăn-nĕl'ĭ-dȧ (Gk. *ἀρχι-*, *archi-*, chief, first, primitive + Neo-Lat. *Annelida*, from Lat. *annellus*, *anellus*, little ring). A group of small primitive marine worms, regarded by Parker and Haswell as a class, embracing only the families Polygordiidæ and Histriodrilidæ, the latter minute egg-devouring parasites of the lobster.

ARCHIAS, är'kĭ-as (Gk. *Ἀρχίας*, *Archias*), Aulus Licinius. A Greek poet, known only through the famous oration *Pro Archia Poeta*, which Cicero delivered in his behalf in B.C. 62. He was born in Antioch and early settled in Rome, where he gained the patronage of the prominent men of the day, as Marius and Lucullus, by writing poems on their warlike deeds. He had obtained citizenship in Heraclea, but illegality was charged, and it was on this accusation that Cicero defended him. The decision of the judges is not known.

ARCHIATER, är'kĭ-ā'tẽr (Gk. *ἀρχίατρος*, *archiatros*, chief physician, whence Ger. *Arzt*, physician). A title given by some Roman rulers to their favorite medical attendants, who were usually Greeks. The use of the title and the office spread to all large towns, and a certain number of doctors were selected as *archiatri*, with salaries and perquisites, but were required to minister to the poor without charge. They also served in the same capacity as modern health officers. See Watson, *The Medical Profession in Ancient Times* (New York, 1856).

ARCH'IBALD, Sir Adams George (1814-92). A Canadian statesman. He was a native of Nova Scotia, and was chosen to the Colonial Legislature in 1869 and in 1888. In 1856 he was solicitor-general, and one of the Liberal leaders. He was active in bringing about the confederation of the British Provinces, and in 1867 was president of the council in the Cabinet formed by Sir John Young, and Secretary of State for the Provinces. During 1870-72 he was lieutenant-governor of Manitoba, and afterward served two terms as lieutenant-governor of Nova

Scotia. He was knighted in 1885. In 1886 he was returned to the Dominion House of Commons.

ARCHIDAMUS, är′kĭ-dā′mŭs (Gk. 'Αρχίδαμος, *Archidamos*) II. (?-B.C. 427). A son of Zeuxidamus, and King of Sparta. He became king after the banishment of his grandfather, Leotychides, B.C. 469. In the fourth year of his reign Greece was shaken by a terrible earthquake, and Sparta was left a heap of ruins. Archidamus was at that time foremost in crushing the uprising of the Helots. Before the Peloponnesian War, he spoke in favor of arriving at a peaceable settlement of the matters under dispute. In B.C. 431 he led an army into Attica, and in the three following years conducted campaigns. He was the father of the famous Agesilaus.

ARCHIDAMUS III. (?-B.C. 338), son of Agesilaus and King of Sparta. He succeeded his father in B.C. 358. In B.C. 367 he defeated the Arcadians in the so-called "Tearless Battle." In B.C. 362, shortly before the battle of Mantinea, he successfully defended Sparta against Epaminondas. At the beginning of the Sacred War he attacked the Phocians. In B.C. 338 he led an army to Italy to aid the Tarentines, and was killed in battle on the same day on which Philip won the battle of Chæronea.

ARCHIDAMUS IV., a grandson of Archidamus III., and King of Sparta. It is not known when he came to the throne or how long he ruled. He was king in B.C. 294, for he was defeated in battle in that year by Demetrius Poliorcetes.

ARCHIDAMUS V., a grandson of Archidamus IV., brother of Agis IV., and King of Sparta. On the occasion of his brother's murder (240 B.C.) he fled, but subsequently returned with the object of reëstablishing his power. He was, however, almost immediately slain by his brother's murderers, who feared his vengeance. Archidamus V. was the last king of the Eurypontid line.

ARCHIDAMUS. A Bohemian lord in Shakespeare's *A Winter's Tale*, appearing only in Act i., Scene 1.

ARCHIL, är′kĭl (of uncertain origin), or **ORCHIL,** ôr′kĭl (*Orseille*). A coloring substance obtained from various species of lichens. The archil is not originally present in the lichens, but is developed by the following treatment: The lichens, collected from rocks near the sea, are ground into a pulp with water and diluted ammonia is added; certain colorless acids (erythric acid, etc.) contained in the lichens gradually change, under this treatment, into a purple substance, *orceïn*, which is the coloring principle of archil. (If in the same process, the carbonate of sodium or of potassium is added to the pulp, ordinary litmus is produced in place of *orceïn*.) Archil is used in the dyeing of silks and of woolen cloth where a beautiful brown color is required; but though a brilliant rich hue is imparted to the fabric, the color is not permanent, being easily acted upon by the rays of the sun. Hence archil is seldom used by itself; the fabric is first dyed by another coloring matter, and then archil is applied to impart to it a brilliant lustre.

Archil imparts a beautiful and durable violet color to marble. It has also been used in coloring wines. It is brought into the market in three different forms. The name *archil* is commonly applied to the ordinary pasty form. When offered in the form of a dry mass it is called *persis*, while powdered archil is known as *cudbear*. The lichens used in the manufacture of archil grow on the rocky coasts of South America, Madagascar, Zanzibar, the Canary Isles, and a number of other places. They belong principally to the genus Roccella. They are sometimes called orchella-weed, or dyer's moss.

ARCHILOCHUS, är-kĭl′ō-kŭs (Gk. 'Αρχίλοχος, *Archilochos*). A native of the island of Paros, who flourished in the Seventh Century B.C., and is regarded as the first of the Greek lyric poets, although the origin of the elegy is claimed by Callinus, a writer whose age seems to have slightly preceded that of Archilochus. Glimpses of his life, especially of the calamities which befell him, were frequently given in his writings. His father's name was Telesicles; his mother was a slave called Enipo. At an early age, becoming entangled in political contests, he abandoned his native town and led a colony of its citizens to Thasos, in 650 or 640 B.C. While here, as he informs us in some extant verses, he lost his shield in a battle against the Thracians, yet not through cowardice. Subsequently he was banished from Sparta, to which he had gone, some say because he had vindicated his conduct in running away from the fight, others, because of the license of his verses. He is said to have gained the laurel-wreath at the Olympic games by an ode in honor of Hercules, but this is doubtful. Having returned to Paros, he took part in the war which broke out between it and Naxos, in the course of which he lost his life. The Delphian oracle pronounced a curse upon his slayer. Variety, novelty, and satirical bitterness characterized his lyric poems; so much so that "Archilochian bitterness" and "Parian verse" became bywords in ancient times. He scourged his enemies in the most merciless fashion, and always displayed the most malicious skill in selecting for his sarcasm the points on which they were most sensitive. It is said that Lycambes, who had promised his daughter Neobule in marriage to Archilochus, having failed to fulfill his promise, was so severely satirized by the poet that, to escape ridicule, both father and daughter hanged themselves. Among the ancients, Archilochus was ranked with Homer. They dedicated the statues of both on the same day, and placed the head of Archilochus beside that of Homer on the same herm. As Homer was the creator of epic poetry, so Archilochus was regarded as the inventor of the poetry of the passions and of biting raillery, and he became the model for the Old Athenian Comedy and for later poets—e.g., for Horace in his earlier period. He is said to have invented many new metrical forms, but his fame and influence were due primarily to his native genius. Only bare fragments of his compositions remain; edited by Bergk, *Poetæ Lyrici Græci* (Leipzig, 1882); Reitzenstein, "Zwei neue Fragmente der Epoden des Archilochos," in *Sitzungsberichte der preussischen Akademie der Wissenschaften* (Berlin, 1899).

ARCHIMAGE, är′kĭ-māj. (1) The foul magician who, in Spenser's *Faerie Queene*, assumes the guise of the Red Cross Knight, and thereby entices Una from her search. He stands, in the allegory, for the personification of False-hood. (2) The personification of Indolence in Thomson, *Castle of Indolence* (1748).

ARCHIMANDRITE, är'kĭ-măn'drĭt (Late Gk. *ἀρχιμανδρίτης*, *archimandritēs*, from Gk. *ἀρχι-*, *archi-*, chief + *μάνδρα*, *mandra*, a fold, i.e., a convent). The title of the highest order of superiors of convents in the Greek Church, corresponding to abbot (q.v.) in the Latin Church; except that, strictly speaking, an archimandrite presides over several monasteries, whereas the *hegumenos* was over only one, and so the latter was nearer to an ordinary abbot. The Russian bishops are chosen from among the archimandrites.

ARCHIMEDEAN MIR'ROR, är'kĭ-mê-dē'*a*n. See MIRROR.

ARCHIMEDES, är'kĭ-mē'dēz (from *Archimedes' Screw;* see below). A genus of fossil Bryozoa of the family Fenestellidæ, common in some so-called "Archimedes Limestones" of the early Carboniferous age in the Mississippi Valley and in some of the southwestern States. The minute animals of this genus dwelt in colonies attached to the ocean floor, and secreted a calcareous framework of spiral form, the axis of which resembles the Archimedes' screw (q.v.). Continuing the comparison—the thread of the screw is produced as a reticulated expansion, upon the upper surface of which are situated the cells that served as dwelling-places for the individuals. The cell-bearing portion of the colony is seldom found connected with the spiral axis, having, by reason of its delicacy, been usually broken off by the action of the waves. Some nearly complete examples have been found in the soft shales of the Keokuk group at Crawfordsville, Ind. See also BRYOZOA; CARBONIFEROUS SYSTEM; and for illustration, see plate POLYZOA.

ARCHIMEDES (Gk. *'Αρχιμήδης*, *Archimēdēs*) (B.C. 287-212). A Greek geometrician and mechanician, the greatest mathematician of antiquity. He was born in the State of Syracuse, in the Island of Sicily. He studied probably under Conon at the University of Alexandria, spending the major part of his life in Sicily. He was killed in the sack of Syracuse. The most important among his extant works include three on plane geometry, three on solid geometry, one on arithmetic, and three on mechanics. In the treatise on the measurement of the circle, the value of π is given as a number less than $8\frac{1}{7}$ and greater than $3\frac{10}{71}$. He also gave formulas for the area of the circle and the ellipse, and for the sector of a spiral whose equation is $r = c\theta$. His demonstration that the area of a segment of a parabola is two-thirds that of the inclosing parallelogram is the first real example of the quadrature (q.v.) of a curvilinear surface. His method of exhaustion is suggestive of the modern methods of calculus. In the works on solid geometry are treated the volumes of spheroids and conoids. His arithmetical work, known by its Latin title, *Arenarius* (sand-reckoner), contains his famous attempt to express the amount of sand required to fill the universe. This work has given rise to the conjecture that Archimedes invented a new and powerful system of notation, all knowledge of which perished with the work itself. Besides his work in pure mathematics, Archimedes also made valuable contributions to applied mathematics, including applications of geometry to the theory of machines, as levers, pulleys, and screws. He also improved the methods of finding centres of gravity. In accordance with a wish of Archimedes, Marcellus raised in his honor a tomb, on which was engraved a sphere inscribed in a cylinder. Cicero, in his *Tuscan Disputations*, gives a charming account of his discovery of the tomb in B.C. 75. The most noted editions of Archimedes' works are those of J. Torelli (Oxford, 1792); J. L. Heiberg (Leipzig, 1881); and T. L. Heath (Cambridge, 1897).

ARCHIMEDES' SCREW (called also SPIRAL PUMP). A machine for raising water, said to have been invented by Archimedes, during his stay in Egypt, for draining and irrigating the land. Its simplest form consists of a flexible tube bent spirally round a solid cylinder, the ends of which are furnished with pivots, so as to admit of the whole turning round its axis, as is shown in Fig. 1. The machine is placed in an inclined position, so that the lower mouth of the tube may dip below the surface of the water to be raised. The lowest bend of the tube will be filled with water, and if now the handle be made to turn in the direction of the hands of a watch, the mouth of the spiral tube will be raised above the surface; and the water inclosed in the tube, having no means of escape, will flow within it until, after one revolution, it will occupy the second bend. The first bend has meanwhile received a second charge, which, after a second revolution, flows up into the second bend, and takes the place of the first charge, which has now moved up to the third bend. When, therefore, as many revolutions of the cylinder have been made as there are turns in the spiral tube, each of the lower bends will be filled with water; and in the course of another revolution, there being no higher bend for the water of the first charge to occupy, it will flow out of the tube by its upper mouth. At each succeeding revolution, the lowest bend will be charged, and the highest discharged. It will be seen that there may be room to dispose a second tube side by side with the

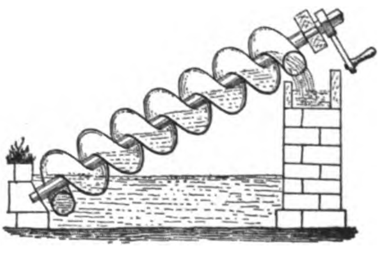


FIG. I.

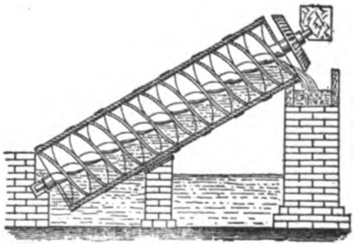


FIG. II.

first, round the cylinder, in which case the screw would be called double-threaded. In the ordinary construction of these machines, the cylinder itself is hollowed out into a double or triple-threaded screw, and inclosed in a water-tight case, which turns round with it, the space between the threads supplying the place of tubes. It is sometimes found convenient to fix the exterior envelope, and to make the screw work within it, the outer edge of the latter being as close as possible to the former without actual contact, as is shown in Fig. 2. This modification of the Archimedes' Screw receives the name of 'water-screw,' and frequently of 'Dutch screw,' from its use in Holland for draining low grounds.

ARCHIMEDES, The Principle of. One of the most important principles in the science of hydrostatics, so called because the discovery of it is generally ascribed to the Syracusan philosopher. It may be thus stated: A body, when entirely surrounded by a fluid, is buoyed up by a force equal to the weight of the fluid it displaces. This is an immediate consequence of the principles of fluid pressure, which prove also that the line of action of the upward force is vertically through the centre of gravity of the displaced fluid. When bodies lighter than water are wholly immersed in it, they displace an amount of water of greater weight than their own, so that if left free to adjust themselves, they rise to the surface and float, only as much of their bulk being submerged as will displace a quantity of water weighing the same as themselves. Accordingly, while bodies heavier than water displace, when put into it, their own volume, bodies lighter than water displace, when allowed to float on the surface, their own weight of the fluid. Bodies of the same density as water, according to the principle of Archimedes, have no tendency to rise or sink in it, for the water displaced by them weighs precisely the same as they do. Similar statements may be made with respect to bodies surrounded by other liquids or by gases—e.g., the atmospheric air. The buoyancy of balloons is an illustration of the principle of Archimedes as applied to the atmosphere. See Hydrostatics.

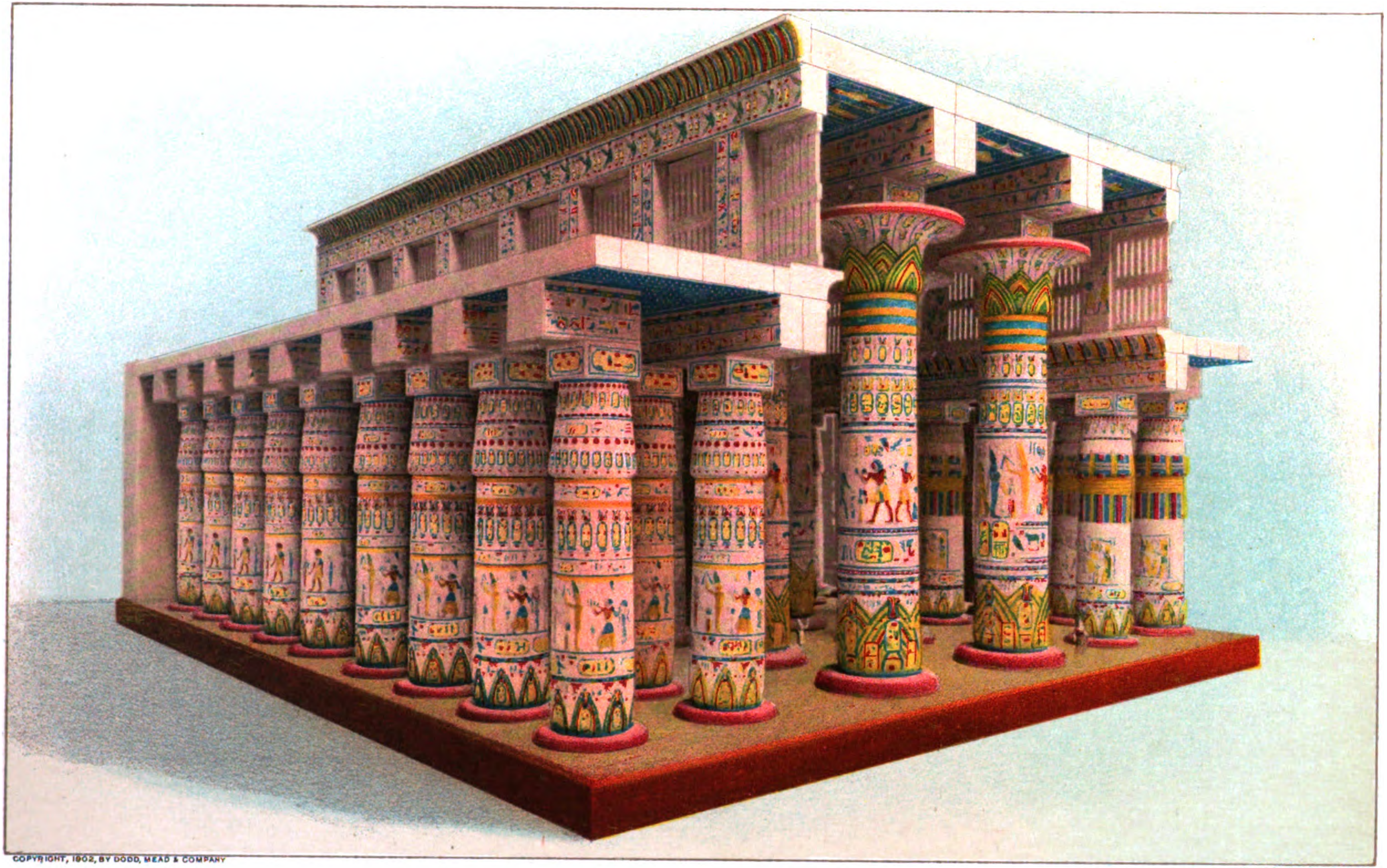
ARCHIPELAGO, ăr′kĭ-pĕl′ȧ-gō̂ (Gk. ἀρχιπέλαγος, *archipelagos*, chief sea, originally the Ægean Sea, to distinguish it from the other smaller Grecian waters; from ἀρχι-, *archi-*, chief + πέλαγος, *pelagos*, sea). A term now applied to any definite sheet of water interspersed with many islands, but formerly restricted to the Ægean Sea (with its islands), which lies between Greece and Asia Minor. The islands are usually divided into two groups, the Cyclades and the Sporades. Of the former group Delos, Lyra, Cythnos, Thera, Andros, and Melos are more prominent; of the Sporades, which belong to Turkey, Rhodes, Cos, Patmos, Samos, and Lemnos are the more significant. They are of volcanic origin, have a healthful climate and beautiful scenery. These islands have played a great part in the course of Greek history, giving to the world poets and philosophers. For a more detailed description, see Cyclades; Sporades; and individual islands.

ARCHITECTS, ăr′kĭ-tĕkts, American Institute of. A society established in 1857. In 1906 it had 27 chapters, 339 fellows, 420 associate members, and 54 honorary members.

ARCHITECTURE, ăr′kĭ-tĕk′tūr (Lat. *architectura*, Gk. ἀρχιτεκτονία, *architektonia*, from ἀρχι-, *archi-*, chief + τέκτων, *tektōn*, worker in wood; carpenter, craftsman). In its widest sense this term includes any kind of construction, such as works of military and naval architecture and civil engineering; but strictly speaking it is building raised by certain æsthetic qualities to the rank of art, as distinguished from purely utilitarian or mechanical building. Its name shows that it was regarded by the ancients as the chief art, comprising all others, the architect being director of works, and responsible for whatever sculpture and painting was used in connection with the building. This ancient tradition ruled throughout the Middle Ages, and it was not until the Renaissance in the Fifteenth Century that architecture lost its right to govern the other arts. Because architecture had this character of the most universal art, using sculpture and painting in subordination, the formation of what we call an architectural style—like the Greek or the Gothic style—was a complex and gradual process. For architecture, being one of the earliest and most constant expressions of civilization, is not the artificial product of the free conception of a few artists, but is fundamentally affected, on the one side by the religious and social elements of society, whose demands it must meet, and on the other by the material elements such as the influences of climate, of materials of construction and decoration, which limit or in certain directions stimulate artistic originality. So that in every age, architecture is a faithful mirror of contemporary society, and at once the most material and the most ideal of the fine arts.

Egypt. In respect to historic development, Egypt and Babylonia—the valleys of the Nile, and of the Tigris and Euphrates—are rivals for seniority in the field, which they seem to have held alone for one or more thousand years, while the rest of the world went without architecture. It is true that the early monuments of Egypt between c.5000 and 2500 B.C. are works of mere building rather than of art. The pre-pyramidal tombs; the pyramids themselves; the primitive chapels or temples connected with them (such as the "Temple of the Sphinx"); the early mastaba-tombs and all other works of the Ancient Empire, have few truly architectural features. The pyramids are a mere mass of material; the temples and tombs, even when supported by piers, have no moldings, decorations, or details that indicate style. It is only in the Middle Empire (c.2500) that the type of columnar temple was evolved, which became the glory of Egypt, and that tombs were made—as at Beni-Hassan (see article on Tomb)—where there were columns and other features with a distinct artistic character—such as the 'Doric' type and the clustered-palm type. The destructive invasion of the Shepherd Kings has forever obscured this second stage of Egyptian architecture, and for a knowledge of its possibilities the Golden Age is that of the New Empire, especially between c. 1600 and 1400, supplemented by the much later constructions of the Ptolemaic Age, almost equally magnificent. Some of the temples were entirely excavated in the rock, like those at Abu-Simbel (q.v. for illustration); others were partly excavated, partly structural, as at Deir-el-Bahari; but the great majority were built entirely in the

EGYPTIAN ARCHITECTURE



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TEMPLE OF KARNAK, FROM THE RESTORED MODEL
IN THE METROPOLITAN MUSEUM OF ART, NEW YORK

open and of stone masonry. A few are sepulchral temples, such as the Ramesseum (q.v.) of Rameses II. at Medinet Habu, but with these exceptions they are purely temples to the gods. Each temple of the usual type was approached through a long avenue of sphinxes or statues, was preceded by an immense façade of pylons connected with an encircling wall, with an open columnar court, at the opposite end of which was a hall of columns forming the prelude to the dark inner sanctuary. This is undoubtedly the earliest conception of a large columnar interior in architectural history, and though its proportions may be heavy, the composition was artistic and imposing, and both sculpture and color were used with architectural details to enhance the effect. Karnak, Luxor, Edfu, and Philæ are the masterpieces over a period of some fifteen hundred years (for illustrations of Edfu and Luxor, see those titles). No vaults, arches, or piers were used in any part of this architecture —only the straight lintel and column. The heavy columns, of so many forms as to rebel at any classification by orders, were placed very close together, so that the effect was not one of spaciousness.

Babylonia and Assyria. Babylonian architecture is less known, but there is enough information about it to show that it reached its full development as an art long before the Egyptian, and that while the latter remained isolated, Babylonia stood at the head of a long architectural genealogy; for Elam and Assyria literally copied it; Persia, the Hittites, and Phœnicians and other nations borrowed from it, and its influence was felt even to China and India. There could be no sharper contrast than that which exists between these two primitive architectures. In Babylonia vaults and arches were used in place of straight lintels and flat ceilings, and there were no long lines of columns, and consequently no larger interiors than could be secured by the span of a single dome or tunnel vault; brick was used in place of stone, thus increasing the heaviness of walls and proportions. The Babylonian style appears to have existed at least 6000 years B.C., and to have lasted without essential change until the time of Nebuchadnezzar. The temples had no large interiors, but were stepped pyramids, remarkable mainly for their great height, their external mass, and the brilliant coloring of their receding stories, faced with glazed tiles. Only in the royal palaces did the Babylonians excel, creating a type which the Assyrians developed with numerous halls and chambers grouped around three main courts. The palace at Tello, the temples at Erech and Ur, give the usual types; but the excavations at Nippur and Babylon are disclosing other splendors. Meanwhile the better preservation and more thorough study of the Assyrian ruins enables to judge somewhat of the details of the earlier style. The temple observatory and the palace of Sargon at Khorsabad were destroyed by some great catastrophe—probably by fire—when they were still occupied, perhaps at the time of the fall of Nineveh; and not only their plan, but also a large part of their structure and decoration in sculpture and color, can be reconstructed. Still, the Babylonian-Assyrian ruins suffer by comparison with the Egyptian, from their poor preservation, largely due to their easily disintegrated brickwork.

Hittites and Phœnicians. The Hittites, the rivals of both Egypt and Assyria, were great builders; like the Egyptians, they used stone and were constructors of fortresses. Of their temple architecture little is known; but their palaces—one of which has been excavated at Senjerli and another at Boghaz-Köi—appear to have been of a type similar to the Assyro-Babylonian. Their works were scattered from the confines of Assyria to the Syrian coast and as far northwest as the interior of Asia Minor. Of the architecture of the Phœnicians very little remains; they also built in stone, and like the Hittites used at first the Cyclopean and polygonal masonry. The great fortifications and ports of Arvad, Tyre, Sidon, and the colonies of Africa and Italy show that the utilitarian side of this architecture was more developed than the religious; for the temples themselves were but small shrines, none of them equaling, apparently, the temple of Jerusalem in size and splendor, though the actual work on this temple was done by Phœnician artisans and artists.

The Ægean Style. It was the migrating Pelasgic tribes of Asia Minor, the Mediterranean islands, Greece and Italy, whose works formed the first link between these early architectures of Western Asia and that of the pre-Hellenic and Hellenic world, forming what is called the Ægean style, which flourished mainly between c.2000 and 1000 B.C. The cities of Crete, as Cnossus, and of other islands, of Troy and other cities in Asia Minor, Tiryns, Mycenæ, Argos, and others in Greece, besides many early Italian cities, such as Norba and Lignia, show how impressive and rugged a style of construction was combined by these races with a delicate and varied decoration, especially in the bee-hive domical tombs (Mycenæ, Thoricus, Vaphio, etc.) in the royal palaces, which were as important in their way as those of the Assyrian kings.

Persia. The second connecting link was Persia. Its great palaces and tombs at Susa, Persepolis (q.v. for illustration), Meshed Murgab, and Pasargadæ, with monuments from Cyrus to Artaxerxes, show the influence of Egypt in their great columnar halls—though they are far more spacious and light than the Egyptian—of Babylon and Assyria in the use of brickwork, sculptured colossi, and friezes of reliefs in the curious double-animal capitals and the enameled tiles. From Lycia and the Greeks of Asia Minor came the high stone basements for their structures, the flutings of their columns, and many details. The hall of Xerxes at Persepolis is more than twice the size of the great hall at Karnak, and shows how such columnar interiors, once introduced into Western Asia, were appreciated and developed. The later dynasties of Persia—both Parthian and Sassanian—threw off many of these foreign elements in a tendency to return to the brickwork, the domes, vaults, and arches of truly Oriental type, as can be seen in the palaces at Sarbistan, Firuzabad (q.v. for illustration), and Ctesiphon.

Greece. Meanwhile, even before the rise of Persian architecture, the Greeks had originated the Doric and Ionic (for illustration, see these titles) orders in all their essential features. The temple, which is the one central figure in this architecture, appears to have developed out of the main hall of the Pelasgic royal palace, as it is seen in Crete, Troy, Tiryns, and Mycenæ, through a middle stage of crude brick walls, wooden columns, architraves, and gables, with terra-cotta revetment and decoration, into the final type of stone temple which was reached as early as the Seventh Century B.C. It is in Sicily and Southern Italy that the earliest works of the Doric style are to be found (Syracuse, Selinus, Metapontum), while the earliest Ionic temples were in Asia Minor, at Samos and Ephesus; but these hardly rival the Doric in age, and their ruins do not belong, like those of the Doric temples, to the primitive structure. The normal type of these temples was a building raised on a three-storied basement, and consisting of one main cella-chamber (*naos*) usually supplemented at one end by a smaller chamber (*opisthodomos*), and preceded at the other end by a pronaos, the whole being surrounded by a colonnade on all four sides, surmounted by an entablature and crowned on the two short ends by gables. The æsthetic Greeks did not plan great columnar halls or courts like those of the Egyptian temples, but relied on external effects almost entirely; on refined beauty of outline and proportion. Never, until the period of decadence, was there any attempt at impressive size or picturesqueness. The Doric style was heavy in proportion and plain in ornament, in comparison with the Ionic, but provided for more considerable figured sculpture in the friezes, metopes, and gables. It prevailed at first over nearly the entire Hellenic world, gaining gradually in delicacy and lightness, especially when handled by artists with Ionian blood, as was the case at Athens, which contains in the Parthenon and the Theseum the two finest works of the developed Periclean Age, though they are almost rivaled by some Italian and Sicilian works, such as the temples of Pæstum (q.v. for illustration) and Girgenti. At this time other works, such as the Propylæa at Athens, became worthy to stand beside the temples, and here the two styles—Doric and Ionic—were for the first time combined. The originality and daring of this Attic school were also shown in the Porch of the Maidens in the Erechtheum (q.v. for illustration). The succeeding Age of Praxiteles, and the Alexandrian Period brought even slimmer Doric proportions, increased favor for the more decorative Ionic style (temples of Miletus and Ephesus), invention of the still richer Corinthian (see article COLUMN), and the development of colossal forms of public, civil, and sepulchral architecture (such as the propylæas, theatres, odeons, stoas, the altar at Pergamus, the mausoleum of Halicarnassus), in which Oriental splendor and love of the colossal overruled Hellenic reticence.

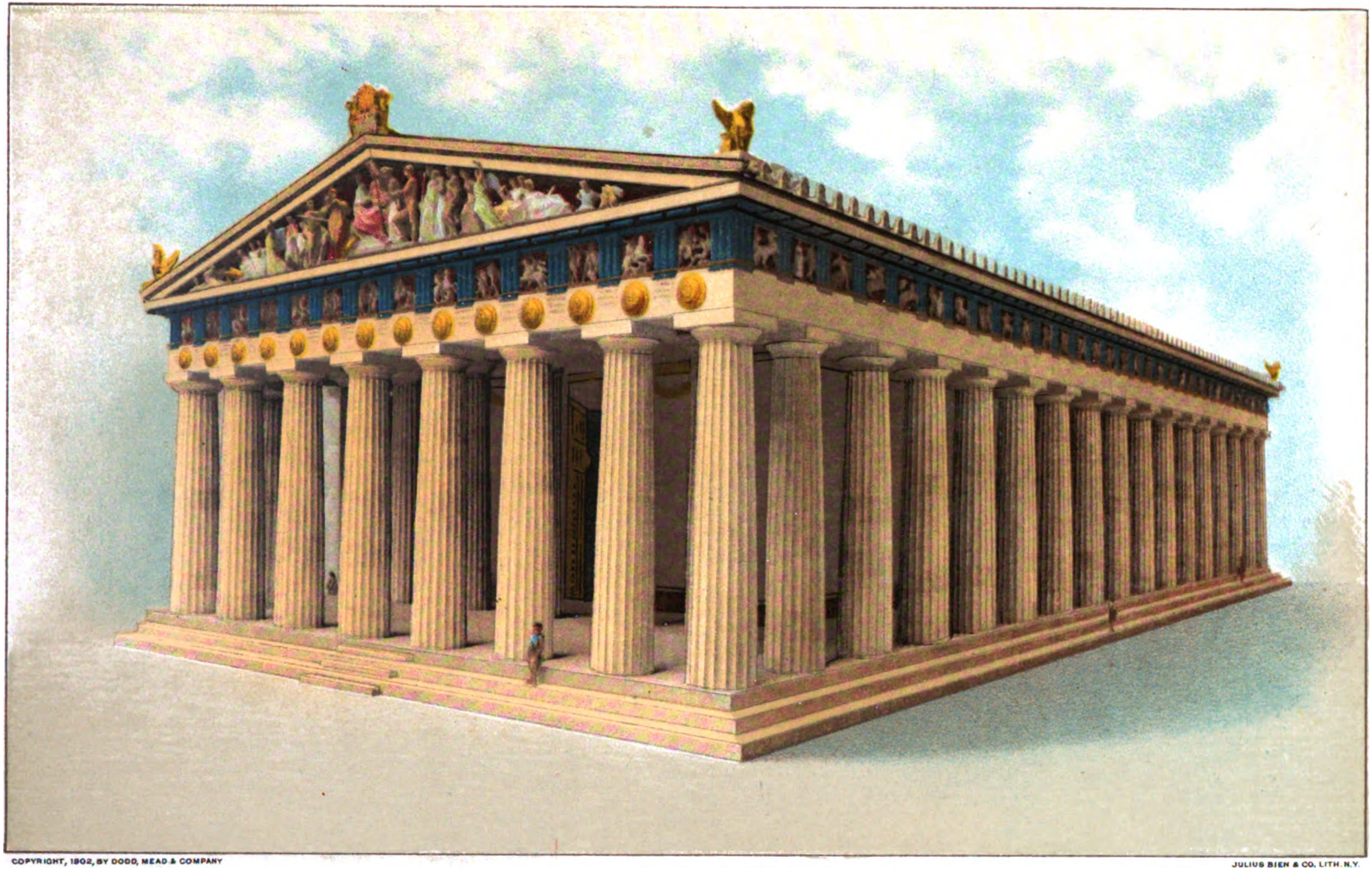
ROME. This prepared the way for Roman architecture. In the Royal and Early Republican Periods, Rome had followed the Etruscan and Latin types: wooden temples with terra-cotta revetments in the Doric style and civil structures of stone, vaulted and arched. These two types remained fundamental, except that before the close of the Republic stone had replaced wood and terra-cotta in the temples, the Ionic style had been introduced by Greek artists, and the Greek orders, with their lintels and columns, had been added as a surface decoration and framework to the constructive arcades in secular buildings. The Greek spirit informed the Roman in the sphere of art, without conquering it, for ordinarily it is not difficult to distinguish the two styles. The Roman temples are not peristyles, but *in antis*, with a very deep colonnade in front, and this alone would be sufficient to make their appearance differ fundamentally, even without the substitution of the heavier Corinthian and composite forms for the Doric and Ionic. But the true nature of Roman architecture appears in its civil structures: in theatres and amphitheatres, aqueducts, triumphal arches, palaces, villas, and, above all, in the baths and thermæ. The Roman genius for composition shines in such great combinations of structures as the Villa of Hadrian, the Palace of the Cæsars, the Forum of Trajan (see article FORUM), and the Baths of Caracalla and Diocletian. And the great vaulted interiors of some of these buildings, such as the Basilica of Maxentius and the Baths of Caracalla, surpass anything previously conceived of in architecture. With the Greeks, architecture had been plastic; with the Romans, who developed the ideals of the Alexandrian Greeks, it was pictorial. It also combined, in the highest degree, utility and comfort with showiness and imposing and costly appearance. The whole civilized world was filled with the monuments of this art—which fell heir to the cultures of both the Orient and Greece.

EARLY CHRISTIAN. When religion again became paramount, with the advent of Christianity, architectural law and development coincided with the building and decorating of churches. The scheme involved the development of large interiors for a crowd of worshipers—quite a different problem from that confronting pagan architects. The public basilica of the Roman fora and the basilical halls of private houses offered models for such a type. The early Christian architecture, with thin brick walls, wooden ceilings, and long colonnaded interiors, at first prevailed everywhere, the poverty of architectural form and detail being partly concealed by rich mosaic and marble ornamentation.

BYZANTINE AND BASILICAL STYLES. But as early as the Sixth Century the Oriental constructive spirit asserted itself once more in the Hellenic Provinces, and two sharply contrasted styles henceforth flourished side by side: the Byzantine domical architecture in the Empire of the East, and the wooden-roofed Latin basilical architecture in the West, especially in Italy. Rome, Ravenna, Salonica, Central Syria, North Africa, are full of early basilicas. Constantinople with Saint Sophia (q.v. for illustration) and others, Ravenna, Greece, Asia Minor, Syria possess numerous Byzantine churches. While the Byzantine style underwent, in the course of succeeding centuries, certain changes, such as the heightening of the drums of the domes, the decoration of the exterior with marble or alternate courses of stone and brick, the use of accessories like porches, colonettes, etc., these differences were of minor importance.

MOHAMMEDAN. In the West, on the contrary, the new civilization resulting from the awakening of the northern races in the Eleventh Century and their fusion with the old stock, created for itself a new architecture of which the first phase is called Romanesque, the second Gothic. But before describing its characteristics, a phase of Oriental architecture which arose in the meantime must not be omitted—that of the Moham-

GREEK ARCHITECTURE



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THE PARTHENON, FROM THE RESTORED MODEL
IN THE METROPOLITAN MUSEUM OF ART, NEW YORK

medan peoples in the great empire founded by the Arabs in the Seventh Century. Syria, Palestine, Persia, Egypt, North Africa, Spain, Asia Minor, and other lands, wrested mainly from the Byzantines, were filled with monuments of a varied and rich style, based largely on Byzantine and Persian models adapted to new purposes and different ideals. The mosques and mausoleums, minarets, khans, hospitals, and bazaars, palaces, oratories, and fountains form a varied group of buildings. The Moorish School of Spain from the time of the mosque of Cordova to the Alhambra (q.v. for illustration) of Granada; and the Egyptian School of Cairo, from the mosques of Hasan and Talun to that of Kaït Bey, are the best known; but the Syrian and Palestinian School, centred at Damascus, and the Persian School, centred at Bagdad and Ispahan, were fully as important—the latter sending out offshoots as far as distant India and Asia Minor. The development of the dome, the stilted horseshoe and pointed arches, stalactite vaulting, geometrical decoration, particularly in brilliant faïence and mosaic—these are characteristies of the Mohammedan schools. They spread coincidently with the political conquests of Islam. The Golden Age began in the Tenth Century. Up to that time there had been two types of mosque, both of them with flat wooden ceilings: that founded on the type of the Christian church with a completely inclosed interior, as the mosque at Cordova (q.v.); and that based on the open court surrounded by colonnades like a cloister, the colonnade being deepest on the one side where the sanctuary was placed, as the mosques of Kairwan, Damascus, and Cairo. The famous Aksa Mosque at Jerusalem held an intermediate position, while the Dome of the Rock, also at Jerusalem, showed how Byzantine domical buildings were at first sometimes imitated. But in the Eleventh Century the final fixed types had been reached. The court-plan and pointed arch were supreme; the geometrical style of ornament was complete with its bewildering tracery, and the dome had triumphed over the flat ceiling. When the Mongols and Tatars overran Islam they adopted the architecture they found, especially the Persian forms. The latest addition to the artistic heritage was through the Turkish conquest of Constantinople in the Fifteenth Century, which led to a return in even greater force of the primitive influence of Byzantium.

ROMANESQUE. Meanwhile Europe had enjoyed the architectural revival of the Romanesque period. First Germany and Italy, then France, and finally England and Spain had felt the new artistic currents. There were no national styles, far less was there any unity throughout Europe. Each province had special characteristics. In parts of Italy, such as Tuscany and Rome, the arrangement of the early Christian basilica was preserved almost intact with the added enrichment of marble and mosaic incrustations and new architectural details. It was the same in most of Germany and northern France until the Twelfth Century. Some sections, as Venice and Sicily, were even strongly affected by Byzantine art. But the most fertile novelty of the age was the development of the vault, which found expression particularly in central and southern France and northern Italy. The dome (Périgord), the tunnel vault (Provence, Burgundy, Spain, etc.), and the groin or cross-vault (Lombardy) were all successfully used to cover churches of the basilical type. The future of architecture lay in this development. Gradually the ribbed groin-vault gained the supremacy and spread to Germany, Normandy, and other provinces of France, preparing the way for Gothic. The great crypts, the porches, towers, façades of rich and varied types, a decoration of figured and ornamental sculpture, made possible by the use of stone in place of brick, were among the prominent features. This phase of vaulted Romanesque was rich, heavy, and impressive. It was particularly the style of the monastic orders.

GOTHIC. Out of it there gradually grew, in the course of the Twelfth Century, in the north of France, the Gothic architecture (q.v. for illustration), the perfect embodiment of vaulted constructive architecture, formed of three main elements: a ribbed groin-vault, receiving all superincumbent weight; piers, receiving their vertical thrust; and flying buttresses, receiving their diagonal thrust. This skeleton, when perfected, freed architecture from the thraldom of heavy walls; hence the development of large windows with their tracery and stained glass, the slender piers, the lofty vaults. The new style was hailed everywhere and spread from the region of Paris gradually over Europe, being best understood in Spain and England, less so in Germany, and least of all in Italy. It coincided with the bloom of all the other arts, which remained the handmaids of architecture, contributing to the rich harmony of the style. For the first time since Roman days, a single style prevailed everywhere, breaking through local schools and national peculiarities. Gothic was essentially of one type and allowed little for individual idiosyncrasies. The typical cathedrals are those of Paris, Amiens (q.v. for illustration), Rheims, and Strassburg, having great choirs with radiating chapels and aisles, a transept with façades, a nave with two or four aisles, a western façade in three sections with two flanking towers. Single towers in the centre, as at Ulm; square screen façades, as at Peterborough; plain square-ending apses, as often in England; all such features are variations from the orthodox type. So are the many cases, especially in Italy, when wooden roofs in place of ribbed vaults are used with Gothic forms, but in violation of Gothic principles. The development of Gothic was progressive. The French churches of the Twelfth Century retained many Romanesque forms and heavy proportions—as at Sens, Senlis, Noyon, and Laon. Larger windows and tracery, slender proportions, and height of vaulting came with the Golden Age of the Thirteenth Century, with Notre Dame in Paris, Chartres, Rheims, Amiens, and Saint Denis. The attenuated geometric style reigned in France in the Fourteenth Century; then the flamboyant until the Sixteenth Century. In England the Early English corresponds to the Thirteenth, the Decorated to the Fourteenth, and the Perpendicular to the two succeeding centuries. Other countries had corresponding but less clearly marked divisions. The general tendency was increase of decorative richness and variety of form, a loss of scientific as well as artistic values, the invasion of prettiness in place of breadth and strength.

THE RENAISSANCE. Although Italy had seen some large Gothic monuments, monastic churches, such as Santa Croce and Santa Maria Novella in Florence, and the Frari in Venice;

cathedrals, such as Siena and Milan (q.v. for illustration), Italian artists were prepared for the Renaissance style founded by Brunelleschi and his followers early in the Fifteenth Century, a style based on the study of Roman mounments adapted to mediæval needs. The new style employed the dome very successfully in its churches, but it was preëminently a decorative and not a constructive style, and, like the Roman architecture which it followed, found its best expression in civil not in religious monuments. Single artists stamped their works with a special style. Brunelleschi, Alberti, Bramante, Sansovino, Michelangelo, Palladio, are not merely names—they are types. The Roman scheme of using the constructive arch within a decorative framework of pilasters or columns and architrave became a Renaissance commonplace. The palaces and civic buildings of Florence, Rome, Venice, Lombardy, Genoa (for illustration see these titles), represent the essential features of the style rather than such churches as those of Santo Spirito at such Italian cities as Florence, Mantua, Loreto, Saint Peter's at Rome, La Salute at Venice. Although early Renaissance decoration is so exquisitely delicate, the heaviness and size of its details grew to be a characteristic. The imitation of classic style was at first not complete; Alberti aimed at it, but it did not reach its cold perfection until Palladio, just before the opposite school of fantastic irregularity, called the Barocco, came to the front before the close of the Sixteenth Century. The style was at first almost entirely in the hands of Florentine artists, who introduced it everywhere; then the Lombards took the lead under Bramante, with a branch in Venice; finally the Roman school, with Michelangelo, Raphael, Vignola, and many others, obtained supremacy. Meanwhile the new style was spreading over Europe, where it first blended with and then superseded Gothic. This occupied nearly the entire Sixteenth Century, for although it penetrated to France about 1500, it did not obtain national foothold in Germany until about 1550, or in England much before 1600. In none of these countries was it used in its original purity, being everywhere affected by national peculiarities. The most artistic changes were those in France, whose château architecture, especially in the Loire region and near Paris, produced masterpieces of composition worthy of comparison with the best Italian work. Blois, Chambord, the Louvre, the Tuileries, the Luxembourg, and Versailles form an unsurpassed series. For illustrations of the Louvre, the Luxembourg, and Versailles, see these titles.

Germany was more foreign to the classic spirit; and the percentage here and in England of purely classic design was much smaller than in Italy or France. The classic orders were less frequently used, and architecture retained more mediæval features. The most interesting classes of buildings in Germany during the latter Sixteenth and early Seventeenth Centuries were the princely castles and residences, of which the finest example is the Heidelberg Schloss; and the town halls, like those of Altenburg, Bremen, and Augsburg.

THE SEVENTEENTH AND EIGHTEENTH CENTURIES. The Renaissance in Italy produced a codification of Roman architectural principles (of Greek types nothing was known) which was embodied in a series of books, the most important being the *Regola delle cinque ordini d' architettura* of Giacomo Barozzi da Vignola (1507-1573) (q.v.). On these books was based the practice of Europe in the Seventeenth and Eighteenth centuries. In Italy the purest classic type prevailed during the latter part of the Renaissance. Bramante in the Tempietto of San Pietro in Montorio, Rome, and elsewhere employed Roman details with great elegance and purity as did also his successors, Antonio da San Gallo the younger, Peruzzi, Palladio, and especially Vignola and Giacoma della Porta, who assisted Michelangelo at the dome of Saint Peter's and the Capitol in Rome. Toward the end of the Sixteenth Century there also appeared a tendency toward extreme freedom in decoration, producing the so-called Baroque style (q.v.), which ultimately caused the degeneracy of Italian architecture. Until after the time of Bernini (1598-1680), however, the Baroque is quite in harmony with the revived Roman style, and lends piquancy to it; as in Bernini's colonnade before Saint Peter's.

The Italian classical movement was continued in France. At first felt in the Sixteenth Century in the work of Pierre Lescot at the Louvre, Jean Bullant at Écouen, and Philibert de l'Orme at the Tuileries, its influence increased until the middle of the Seventeenth Century, and culminated in the prodigious undertakings of the reign of Louis XIV (1643-1715), at Versailles, Marly, Trianon, and Paris. The movement affected not only the buildings themselves but their emplacement. The large lines of the plan of Paris may be traced to the reign of Louis XIV.

The principles established in the Seventeenth Century continued in the Eighteenth and developed into the current French architecture of the present day. French decoration is an adaptation of the Baroque style, and has passed through phases which correspond to the reigns, and have taken the names of succeeding monarchs; style Louis XIV, Louis XV, Louis XVI. (See Rococo.) French architecture crystallized about the formation of the Académie Royale d'Architecture in 1671, which is now merged with the Institute. Its school is perpetuated in the École des Beaux Arts (q.v.).

In England the course of revived classicism had not the strength developed in France, but it received a powerful impulse from Inigo Jones (1573-1652) and his follower, Sir Christopher Wren (1632-1723), the great architect of Saint Paul's Cathedral, who was cotemporaneous with the reign of Louis XIV. It derived also a certain consistency from the use of the book and drawings of Palladio, introduced by Richard Boyle, Earl of Burlington (1695-1753). The term English Palladian applies well to work done until after the time of Sir William Chambers (1726-1796). The German people, during the Seventeenth and Eighteenth centuries produced much interesting architecture, but developed little which is characteristically national. They yielded easily to Italian and French influences.

Throughout the early part of this period Flanders and Holland adopted the classical and Baroque traditions of Italy, with which country they were in close commercial relations. The architecture of Spain in the Sixteenth Century developed a peculiar form of Renaissance called plateresque and in the Seventeenth and Eighteenth centuries is a picturesque outgrowth of the Italian Baroque (see CHURRIGUERESQUE).

COLONIAL ARCHITECTURE. In general this

name is applied to the architecture of any colony, which reflects the contemporaneous work of the mother country. It is here used of the very important colonial styles developed in the Americas during the Eighteenth Century.

The Spanish colonies, especially Mexico, produced interesting architecture directly derived from the late Baroque buildings of Spain, sometimes called Churrigueresque (q.v.) which was, doubtless, occasionally executed by native workmen with Aztec traditions. As in Spain, it shows a tendency to concentrate decoration at points, as about doors or towers, where it is contrasted with large, plain wall surfaces. There is also a brilliant use of colored tiles.

Mexican architecture is famous for the developement of the low Spanish domes of which there are many fine examples by the native architect Tresguerras. In the neighborhood of Southern California the use of sun-dried brick (adobe) gave origin to a unique form of Spanish-Colonial which is called "Mission Architecture."

The term Colonial, as applied to the English colonies, includes all the work done under the influence of English examples in the Eighteenth Century, the period extending also well into the Nineteenth Century. Unlike the Spanish the northern buildings are elegant, precise, and a little dry in style, with a decided leaning toward classicism, not in accuracy of design but in purity of line and proportion. Before 1730 building was confined to dwellings, the most pretentious being stone houses which were intended to serve also for defense. As the country became settled, and it was possible to build with more elegance, carpenters and builders instructed themselves by the use of English architectural books by Sir William Chambers and others. In 1797, Asher Benjamin, a builder extensively employed in New England, published at Greenfield, Mass., "The Country Builder's Assistant," an excellent compilation based on the English manuals. This work, with others imitated from it, fixed the practice in that part of the country. Perhaps the most interesting product of the New England Colonial style is the series of charming meeting-house steeples suggested by the spires of Sir Christopher Wren's churches in London.

In New York and the middle part of the country there is the same adaptation of English details, but with broader and richer effects. In the South the ample country residences gave fine opportunities.

Colonial architecture was influenced to a slight degree by French practice. From 1784 to 1787 Thomas Jefferson was Minister to France, and not only took much interest in architecture, but also assisted young American architects, like Charles Bulfinch (q.v.), in their studies. In the buildings which he superintended, however, his house at Monticello, Virginia, and the University of Virginia, he followed English text-books chiefly. A French draughtsman named Mangin was employed on the City Hall in New York, finished 1811, and left traces of French influence there, but the actual architect was John Lacourt. An able Frenchman, Pierre Charles l'Enfant, made the plans according to which the city of Washington was laid out.

The Capitol in Washington, although built mainly in the Nineteenth Century, may still be considered the chief Colonial monument, all of it, except the dome, being the work of architects trained in the Eighteenth Century.

THE NINETEENTH CENTURY. The regular sequence of developing styles ceases in an abrupt way with the wars of the French Revolution. Before that time no style of architecture had ever existed which was not in the main the result of natural evolution. Since the close of the Eighteenth Century, however, there has been no true style anywhere, but merely a series of imitative fashions chasing one another rapidly across the background of equally mutable social conditions.

The first of these fashions which attracts our attention is the so-called *Style Empire*, the character of decorative design influenced in part by new study of Roman antiquity and partly reproduced from the work of the preceding reign and fitted to the grandiose requirements of Napoleon's brief dominion. The French Republic had shown a marked deference to what were supposed to be the thoughts and ambitions of the Roman Republic as before the civil war of Marius and Sulla, or before B.C. 100, and a fancied attempt to reproduce the Roman forms is evident in all the work of the Napoleonic epoch. This, however, applies only to the larger masses, for in the furniture and metal work of the time there is more of Louis Quinze than of Æmilius Paulus—a formalized rococo rather than a modernized Greco-Roman style. The endurance of this fashion was brief, however. The Arc de l'Etoile and the great Church of the Madeleine in Paris were begun and their character determined during this period. Also the character which we associate with Paris of wide and elegant avenues was fixed by Percier and Fontaine, although such arcades as those of the Rue de Rivoli and the Rue Royale were not destined to become a favorite addition to important streets. The influence of the Empire style was hardly felt outside of Paris; and for succeeding students it has been rather a fashion in costly furniture and the hanging of walls with silk than an architecture of dignity.

With the return of peace there came to Europe the most completely non-artistic time which had there been known since man emerged from the period of rough-stone implements. It is a matter not settled to the satisfaction of any inquirer, the cause of the complete disappearance from the European mind of decorative ability during the first half of the nineteenth century. In Great Britain the unassuming and, on the whole, agreeably simple buildings of the Georgian period were copied, as they were also in the United States; and contemporaneously with this, in the countries above named, there was a strong inclination to study the newly discovered monuments of pure Grecian art, the buildings of Athens and Ionia, and also the remains of Roman imperial art existing in Italy and its neighborhood. The closing years of the Eighteenth Century had produced a number of extraordinarily important books, in which, for the first time, the facts concerning those ancient buildings were made known to Europe. Under the influences thus introduced into the mind of the Nineteenth Century, there were built Roman porticoes with square box-like churches behind them, such as the magnificent Cathedral of Saint Isaac in Saint Petersburg; and in such buildings as this the Imperial Roman feeling for costly and splendid material revived. Smaller churches of this sort are somewhat abundant, as in London, Saint Pancras; and in America, the imitations of marble churches executed elaborately in pine wood. The same influence in other architecture than that of churches is seen in the famous Walhalla on the hills near Regensburg, the Hall of Fame at Munich, the Capitol at Washington (q.v. for illustration), Saint George's Hall in Liverpool, the Bourse in Paris, and the great theatre of Bordeaux. It is curious to find this Roman style of colonnades and pediments decorating an otherwise severely plain building revived without essential changes at the close of the Nineteenth Century. The reason for it is not far to seek—it is in the impracticability of producing an interesting new style founded upon classical traditions, unless with the willing and continuous labor of several decades at least. To copy Roman forms has proved easy to able and well-taught men, as all that is needed is free expenditure upon the building and the possession by the designer of a number of measured drawings. To found a new style upon it, whether deliberately, as by the careful thought of men who can design and who are also students, or more unconsciously and naturally by the work of uninformed builders who take the details their masters used before them and modify them to suit the new requirements—to do either has proved impracticable. The immediate result, chronologically speaking, of the first Neo-Roman revival was the introduction into domestic and civil building of the insignificant architecture known to us all from the abundant remains left from the years between 1830 and 1870. The Hôtel de Ville, in Paris, as it was under Louis Philippe and until its destruction in 1871, contained only the central mass of the building of Henry IV., the wings being wholly of the "bourgeois" and unimpressive style of which we are speaking. The vast structure in Washington occupied by the departments of State, War, and the Navy is an almost perfect example of the class of buildings in question. There was more sincerity in the work of some English architects, apart from the Gothic revival named below. Thus the clubhouses designed by the elder Charles Barry (Sir Charles), such as the Travellers' and the Reform in Pall Mall, and Bridgewater House, by the same artist, were all built between 1830 and 1850, and all have some architectural character. This epoch saw also the work of King Ludwig I. in Munich, often of a character wholly different from the pseudo-Greek buildings named above. Thus, the Royal Library was finished before 1843, in a style borrowed from Italian palazzi of the Fifteenth Century, as was also the southern front of the royal palace (Königsbau); and of this time also was the Hauptwache, a reduced copy of the Loggia de' Lanzi at Florence. The buildings of the new Louvre, built during the reign of Napoleon III., just miss this expressionless vulgarity of style; they miss it in that they are large in their parts, built at great cost, and adorned by a school of highly trained architectural sculptors to whom it was impossible to turn out other than interesting details. Even the dismal Hôtel de Ville above mentioned would have had some interest had it been covered with elaborate architectural sculpture of admirable workmanship. The reign of dullness continued until 1860 or later; but there was much that was interesting in the way of individual buildings. The Library of Sainte Geneviève, in Paris, is an example of the very small group of buildings called Neo-Greek—which term is a misnomer, pointing rather to the studies of the founders of the school than to their finished work. The buildings especially classed under this term, as the library above named and the rebuilding of the Palais de Justice, have no Greek character; and even Visconti's tomb of Napoleon I. is rather Neo-Roman —as if a prolongation of the *Style Empire* rather than a novel departure. Of this epoch, too, are the basilica churches—Saint Vincent de Paul and Notre Dame de Lorette, in Paris, and Saint Boniface, in Munich—buildings of a style most promising to one who hopes for original work in the future, but not as yet carried farther.

This epoch, 1830 to 1870, includes also the time of the Gothic revival, properly so called; that is, of the earlier years of that movement—of the time when the reformers were full of hope and courage, and believed that the sincerity and the logical construction and decoration of Gothic churches were capable of being reproduced. The intellectual movement assumed that modern churches were cold, devoid alike of ornament and of interest; while the churches of the Fourteenth Century—for it was the later Gothic which first attracted the student—were full of interest. Therefore, those engaged in the movement undertook to study the forms and the details, and to reproduce them exactly for a while, believing that there would come inevitably a Gothic style which would be either the old one revived or some modification of it still more nearly suited to modern needs. Again, as to civic and domestic buildings, the enthusiasts believed also that these would be far more admirable if they were built as the Fourteenth Century Italians and the Fifteenth Century Frenchmen built. Moreover, this style admits of all kinds of adornment by means of the colors of natural material. In England, in France, and in Germany, preceding generations had done little of that; but in Italy they did much, and it was deemed clear that modern architects might study Italian as well as other forms of Gothic. All this can be found at length in the writings of the authors of that time—authors of whom some are still in repute—and in the work of a host of later writers, men who also were inspired with the same hope of speedy improvement of the artistic situation. One set of studies of the past having failed, another was thought sure to succeed; and only after twenty years of effort did it begin to be clear that nothing complete was to come from the Gothic revival. The most costly building of the style was almost the earliest, the great Westminster Palace (q.v.), designed by the elder Charles Barry, who was knighted as having been the architect of the home of the British Parliament. This building is studied from the most formal type of the Tudor style, and the attempt to cover it with rich decoration only enhances the evident formalism of the constantly repeated details of ornament. In spite of this, in Germany and in England, the style became almost exclusively ecclesiastical, while the classical methods prevailed for civic buildings. In France it had so little effect upon the strongly organized and deeply convinced workmen and thinkers of that most artistic of modern nations that only a few buildings of completely mediæval character were built, either in France itself or in the countries under immediate French influence. These, when they were built, had, however, this great superiority, that they were completely constructional, vaulted in masonry if not according to the strict Gothic principle of rib vaulting, which was as yet barely understood, and consistent in all their parts, while the English work of the same period and American imitations of it were very apt to be disfigured within by plaster imitations of mediæval forms. Since 1870 there have been some evidences of more thoughtful and therefore more original ways of working. There have been some designs which are not based upon buildings of the past more than this, that the old systems of proportion, the old methods of making a building effective, have been in the designer's mind. One of the most carefully studied of these is the great building on the Trocadéro hill at Paris, which was begun about 1875 and finished in time for the great Exposition of 1878. This is a vast building, more than a quarter of a mile, measured in a straight line, from out to out, occupying a most advantageous position and richly adorned by sculpture on a large scale in its immediate surroundings and outskirts rather than in its own walls and doorways. It is not possible to say to what historical style it belongs; it belongs to none. Less entirely free from possible classification under an ancient name is the best of American free work, such as Trinity Church in Boston, which, although entirely Romanesque in spirit, is studied from the Romanesque of Europe, and contains features dimly traceable to French, to Spanish, and to English antiquity, while all are harmonized into a modern design. Such a design, too, was All Souls Church in New York, a study indeed of Italian Romanesque, but as completely a modern design as the Trocadéro Palace itself. So there are some smooth-faced street façades in which, the question being merely to design a front and to arrange the fenestration agreeably, great independence has been shown. Great Britain has been rich in buildings of this sort, for the devotion of many of her best designers to the Gothic revival had at all events given them the habit of constructional designing; they have been, on the whole, far less controlled by tradition than the Frenchmen, while also far less successful in producing buildings of permanent charm such as results from thoroughly matured designing. It is to be noted that a tasteful and satisfactory design is much more quickly got in a style already familiar to the artist and to his critics, the cultivated public. Cultivation in such matters must go far beyond the knowledge gained by travel and by general reading before the student can recognize the attempt at new methods of design and partly judge them. There is, therefore, a very strong inducement to every designer to work on the old lines.

The novel systems of building caused by modern scientific advance have not had so much influence upon design as had been anticipated. In France, as early as the middle of the Nineteenth Century, it was seen that wrought-iron was to become an important element in future building, and those who sought to influence for good the designing of the time pointed out many ways in which it could be utilized. At the same time, in the United States, cast-iron in hollow columns and in shells, imitating cut-stone work, was introduced; and while the shop fronts of all American cities came to be made of this material, there were also very many façades which, though apparently of stone masonry, were from street level to roof composed exclusively of a series of cast-iron members held together by riveting. Again, at a later time, when the steel-cage construction for high buildings was introduced, as is shown below, the opportunity for a fresh movement in design seemed to be given; but this was rendered impracticable, partly by the legal requirement that iron should everywhere be protected from the effect of heat in case of conflagration, and partly by the same willingness to repeat old forms under new conditions which had controlled the designing of the cast-iron fronts mentioned above. Still another opportunity seemed to be afforded for the use of ironwork in design; namely, in the buildings of the great expositions, from their commencement in London in 1851 through the entire half-century; but here it has been the exception rather than the rule to base the design upon the ironwork itself. The disposition to make the buildings of one of these great fairs as attractive as possible to a multitude of people, and the need of great haste in their construction, has prevented thoughtful consideration from being given to their design, and the introduction of staff and of plaster boards has facilitated the imitation of recognized architectural forms in mere outside work, in the simulacra of architectural structures, supported, indeed, by an iron frame, but not recognizing that framework as part of the building proper. Thus, in one of the great halls of Chicago of 1893, or of Paris in 1900, there was, without, what passed for a cut-stone façade of great elaboration and necessary cost; but within, this character disappeared completely, and the whole interior was a vast cage—a greenhouse as completely non-architectural as the original building in Hyde Park in 1851. Here and there a building has been built constructionally of wrought-iron, having the spaces between the members of its light frame filled in with colored brickwork or the like. Such a building was that of the municipality of Paris at the Exposition of 1878. Its walls were of common hard brick, between uprights and horizontals of wrought-iron, while its wide and very high doorways were enriched beyond all modern practice by a combination of terracotta in high relief and glazed and richly painted tiles. Similar attempts have not been more numerous during the later years of the century than when the subject first excited attention. Thus, the excellent reading-room of the National Library at Paris, roofed by means of wrought-iron arches carrying cupolas of brickwork faced with tiling, dates from the years before 1865. The most effective ornamentation in the days of the Gothic revival is that of the Oxford Museum, completed about 1860; and the most effective artistic ironwork in any of the larger buildings of the great expositions was that of the square domes of the Paris building of 1889. In this way the few attempts at artistic ironwork have been scattered over a half-century, without resulting in any determined school of design. In like manner a few houses have been built fronting on the streets of Paris, and in certain Belgian cities, in which the iron framework is treated on the same sound, constructional principles as those involved in the wooden "half-timbered" construction of the Fourteenth and Fifteenth centuries. These, however, are very rare exceptions, and the only recent development of the same fine-art treatment of metal has been in the very moderate attempts at logical building of shop fronts, balconies, greenhouses, and shelters above doorways of entrance. The few attempts to treat strictly engineering structures, bridges, and the like, in an artistic way have not been successful.

The steel-cage system of building dates from about 1880. It was ten years earlier when it was first noted in the greater cities of the United States that business offices could not be rented to advantage nor large hotels managed successfully without a free use of the elevator (the lift). Offices in the fifth story would not rent at all, nor those on the fourth story easily, unless they had this "elevator service." But with the introduction of elevators into office buildings and hotels there came the easy possibility of building to the height of eight and nine stories instead of to five. Ten years later there appeared suddenly the possibility of building what appeared to be an ordinary edifice of masonry with an actual structure of steel uprights and horizontals firmly bolted together, braced where necessary, and of any conceivable height. All the exterior walls, which were thin and of masonry, were supported by the steel structure, and therefore the walls of the basement story occupied no more horizontal space than those of any upper story; whereas, in a masonry building, the walls or piers grow much thicker below as the height increases, and more valuable space in the ground story is lost in the attempt to get less valuable space above. Immediately upon the introduction of the constructional steel frame, buildings were increased in height from nine or ten to twenty or more stories. Elevators were built which ran at greatly increased speed, and these could be arranged in groups, some to run "express" to the twelfth story, perhaps, while others stopped at every floor from the first to the eleventh.

In spite of the radical character of these changes in construction and plan, no sign of any architectural result has appeared. This is in part owing to the purely commercial character of the buildings. They must be built as quickly as possible, because of the monthly loss of rent to the owner while his plot of ground remains unproductive, and they must be as inexpensive as possible, in order that the annual rental may bear a better proportion to the cost. Hitherto in the history of the world no architecture of any value has been developed out of any such conditions. The efforts of two or three architects to invest these buildings with a logical and appropriate system of external design are worthy of the highest praise, but have not been followed generally; nor have they produced marked results as yet.

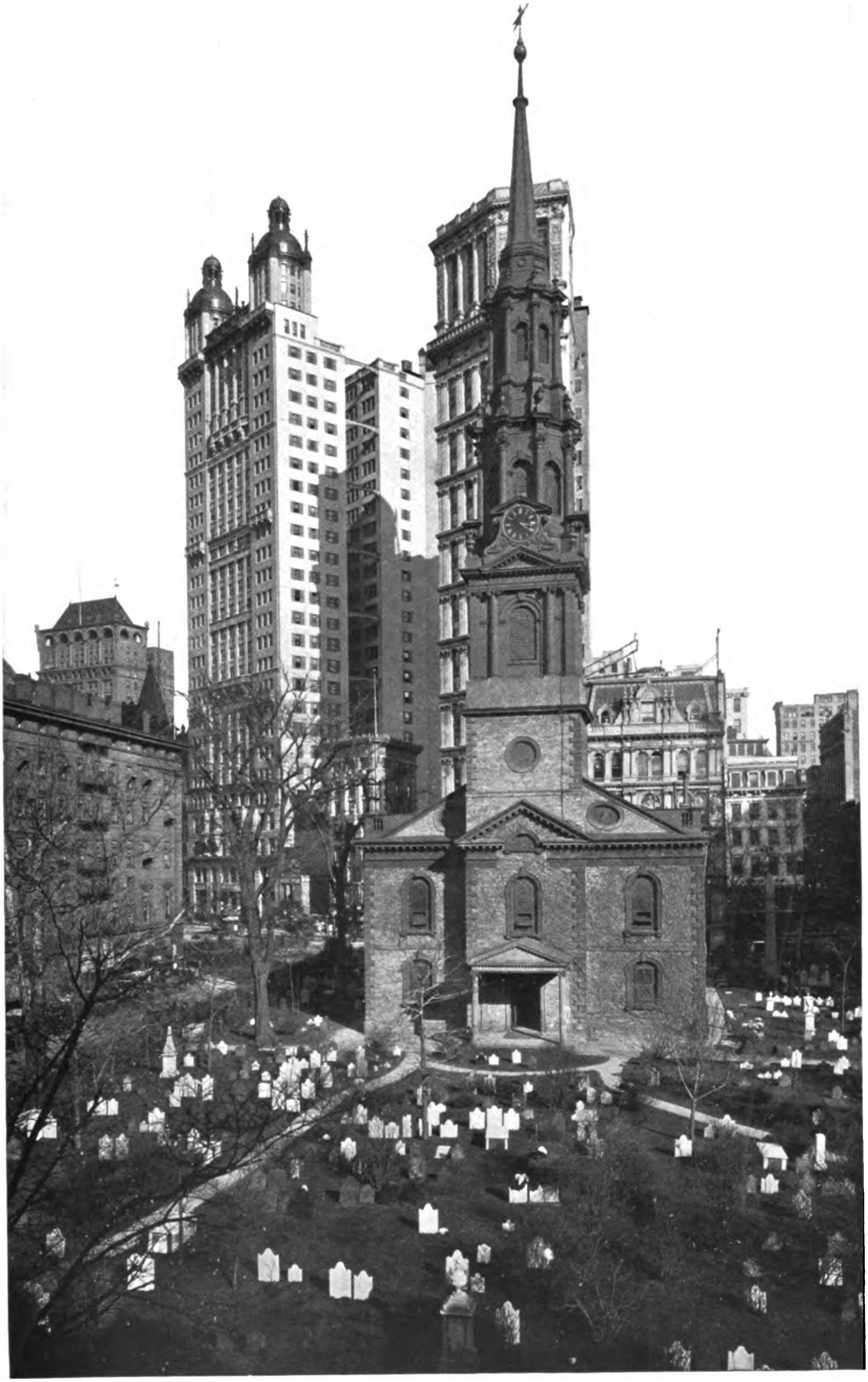
RECENT ARCHITECTURE. The profound peace enjoyed by the people of Western Europe and America in recent years has encouraged abundant building. In Europe the necessary monuments and public buildings have been built according to customary formulas, but in minor works there has been a tendency toward extreme eccentricity. An abandonment of old conventions and the development of new has created the so-called *Style Nouveau*, which is represented in all the arts; but has had most effect for good or evil in the art of architecture. So far as the *Style Nouveau* has contented itself with the abandonment of meaningless excrescences and tended to bring architecture back to its fundamental relations of color, line, and form, its work has been beneficial. But it has seldom stopped at this point. It has usually proceeded to the invention of new forms which have little reason for existence and little beauty.

Like most modern art movements, the *Style Nouveau* crystallized in Paris. In France, however, its eccentricities have been mitigated and even avoided by the prevailing good taste of the nation. Among its recent achievements are the *Pavillon Bleu* of the Exposition of 1900 and the Castel Béranger in Paris. Of greater importance than their achievements at home are the commissions obtained by French architects in foreign countries; such as the group of state buildings in Lima, Peru, and the splendid but showy Congress Palace for Mexico by Bénard.

The most extreme development of the *Style Nouveau* may be studied in Germany and Austria. Although the results in the former country are sometimes happy, especially in suburban residences, they frequently violate all laws of structural expression and propriety. In Vienna, an important centre of the movement, the new Trainkaserne (barracks) and the Young Women's Academy are examples of modern design controlled by good taste. The application of color to stuccoed exteriors has received much attention in that city. In Bohemia the new art has run to riotous extremes in external design. A good example of a rational style is the recently completed City Hall of Copenhagen, by Martin Nyrop. In Holland and the Low Countries generally there has been much interesting work in brick.

In England where the art of William Morris, one of the forces underlying the *Style Nouveau* had its home, the less attractive phases of the movement have not found encouragement. Since the Victorian Gothic revival in the middle of the Nineteenth Century the sympathy of English architects has been with mediæval motives and ideals. Classic conventions have been used solely for secular buildings and then not with interest and often without correctness. The Mediæval manner, Romanesque or Gothic, the churches of John Francis Bentley (d. 1902) and especially his newly completed Roman Catholic Cathedral of Westminster may perhaps be considered the most characteristic. There is also a new cathedral at Liverpool by Gilbert Scott.

Undoubtedly the most powerful later architectural achievements have been in the United States. The rapid advance in individual fortunes and in the general well-being of the people, the invention of new and facile methods of construction, already mentioned, have brought about a prodigious amount of building. This has been accompanied by the best intentions in an artistic way, but the old architectural conventions have not adapted themselves to the new conditions, and for the most part, the high office buildings, apartment houses or hotels have not been attractive or interesting. The success of the Chicago exhibition of 1893 and of the Buffalo exhibition of 1901 called attention to the possibility of introducing large and symmetrical arrangements in our still



"ELEVATOR" ARCHITECTURE

ST. PAUL'S CHURCH, NEW YORK, AND SURROUNDING BUILDINGS

new and rapidly growing cities. Of these Washington has presented the most promising field for experiments, inasmuch as it is still possible to carry out, in its main features, the original design of De l'Enfant for the laying out of that city (1791). In 1902 a commission for formulating plans was appointed. A commission recently appointed to plan the rearrangement of considerable portions of the city of New York has published (1904) a report which furnishes guidance for future work. Many minor cities have followed these examples.

Important buildings have been undertaken by the United States Government; such as the enlargement of the Capitol at Washington, the Custom House in New York, the Post Office and Court House in Cleveland, and the federal buildings in Indianapolis and San Francisco. To these may be added many important state and municipal buildings, the finest of which is the Minnesota state capitol at St. Paul. The large number of libraries built by public institutions and made possible by the munificence of Mr. Carnegie have enabled architects to solve the problems presented by that type of building more satisfactorily.

If libraries and museums be included under the category of *educational architecture*, this division probably constitutes the most important and prolific field of American architecture during recent years. All the great universities and many colleges have made substantial additions to their buildings. Among the most prominent examples of extensive plans now being carried out are those of the National Military Academy at West Point, the Naval Academy at Annapolis, the University of California at Berkeley, and Columbia University in New York City. In ecclesiastical architecture the most notable achievements in recent years have been the choir of the cathedral of St. John the Divine, the many storied Broadway Tabernacle—all in New York City—and St. Paul's Church in Chicago.

In *commercial architecture* the bank buildings have generally been the most elegant and pleasing, partly because of their moderate height and simple and massive construction. Among the prominent examples of 'sky-scrapers' are the tower-like Flat-iron and Times buildings and the Trinity Building in New York City; the First National Bank and the Railway Exchange in Chicago. Of high architectural importance are the palatial and extravagantly decorated hotels in the larger cities; such as the Astor and St. Regis in New York, Bellevue Stratford in Philadelphia, and the Willard in Washington. Mention should also be made of the great railway stations now in process of erection: the Union Station at Washington and the magnificent new Pennsylvania and New York Central stations in New York City.

In this brief survey there has been no place for the architecture of Farther Asia, of India, and the neighboring provinces; of China and Japan: still less for the architecture of Mexico, Central America, Peru, etc. All these are described under their especial heads, and under ARCHITECTURE, ANCIENT AMERICAN. The details of all the styles here mentioned are also given under the separate titles ASSYRIAN ART; BABYLONIAN ART; BYZANTINE ART; CHRISTIAN ART; EGYPTIAN ART; GOTHIC ART; GREEK ART; MOHAMMEDAN ART; PERSIAN ART; PHŒNICIAN ART; RENAISSANCE ART; ROMAN ART; ROMANESQUE ART. Under the general head ART, HISTORY OF, a review is given of all the various classes of titles under which the architectural material in the cyclopædia is classified, such as biographies of architects, descriptions of various kinds of buildings, definitions of terms, etc. This history of the science and material of construction is given under BUILDING.

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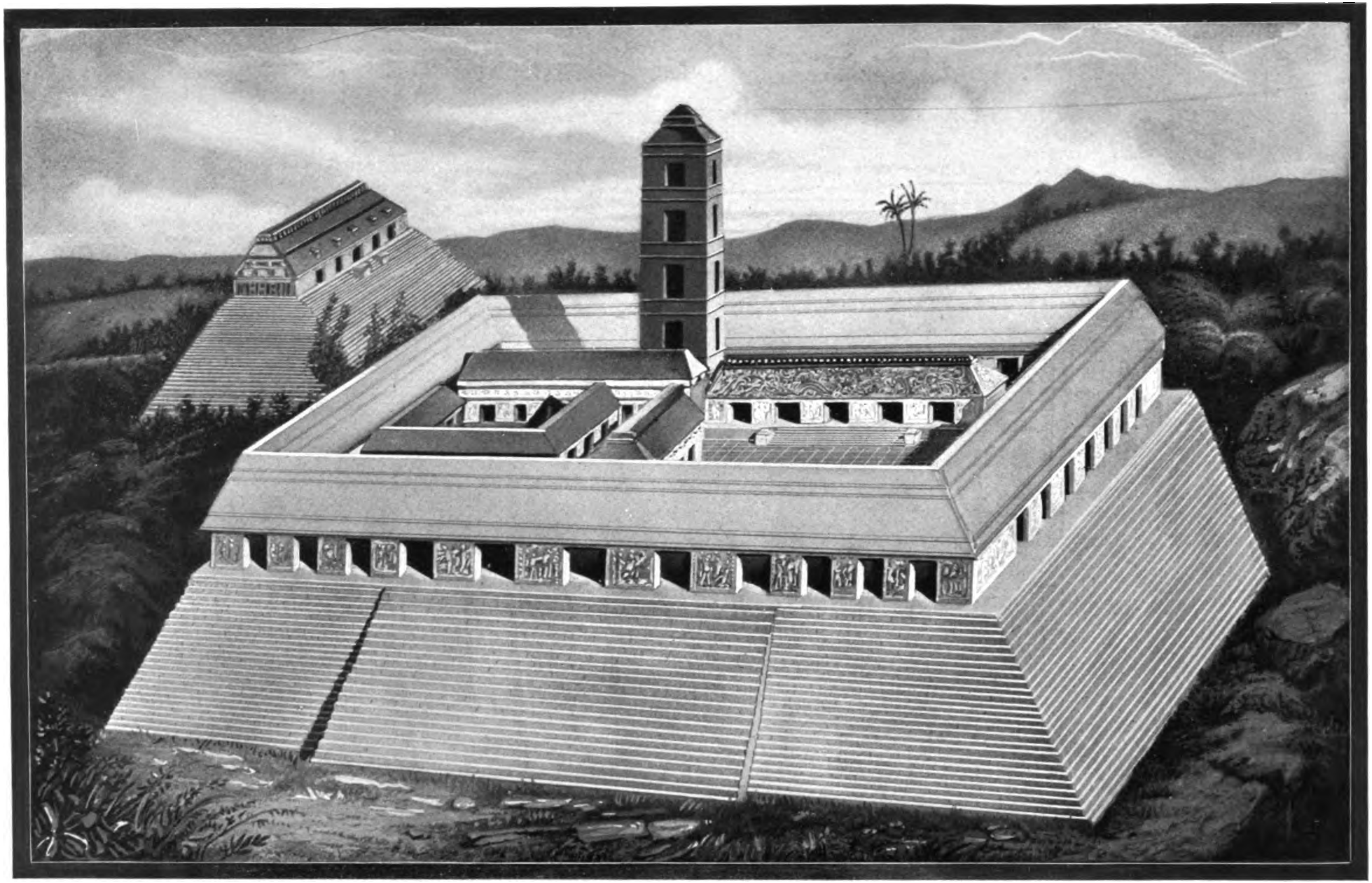
The German series is more detailed, and is solely architectural. It is the *Handbuch der Architektur*, ed. Durm (Darmstadt, 1895), and contains special volumes on the theory and practice of architecture, as well as its history. Its four sections are entitled: I. *Allgemeine Hochbaukunde* (materials; statics; methods; forms); II. *Baustile* (History, in four sections; Ancient, Mediæval, Renaissance, and Modern); III. *Hochbau-Constructionen* (elements of structure; foundations; external features; internal features; specific details); IV. *Entwerfen, Anlage und Einrichtung der Gebäude* (composition; buildings for dwelling and trade; buildings for agricultural and provisioning purposes; public-houses, clubs, and halls, etc.; buildings for health, charity, etc.; educational, scientific, and artistic establishments; civic, governmental, administrative, and military buildings; religious and memorial structures; the city). There are a number of quarto volumes in each of these sections and subsections, several of which have been published. In the historical section the most valuable are: Durm, *Die Baukunst der Griechen* (Darmstadt, 1892); and Die *Baukunst der Etrusker und der Römer* (Darmstadt, 1885). The others are: Essenwein, *Die*

Ausgänge der classischen Baukunst (Early Christian), and *Die Fortsetzung der classischen Baukunst im oströmischen Reiche* (Byzantine); Franz Pascha, *Baukunst des Islam* (Darmstadt, 1896); and Essenwein, a series of works on *Die romanische und die gothische Baukunst* (Darmstadt, 1889-92), including his volumes on *Military Architecture* (*Kriegsbaukunst*), and *Domestic Architecture* (*Wohnbau*).

There are two principal dictionaries of architecture in English: *The Dictionary of Architecture* of the English Architectural Publication Society, on a large scale, never completed; and Russell Sturgis, *Dictionary of Architecture* (3 vols., New York, 1901-02). Gwilt, *Encyclopædia of Architecture* (London, 1888), is handy to consult. In French there is Planat, *Encyclopédie de l'architecture et de la construction* (Paris, 1890-93). An excellent modern architectural manual is Gaudet, *Eléments et théorie d' l'architecture* (4 vols., Paris, 1902).

ARCHITECTURE, Ancient American. No historical sketch of aboriginal American architecture is possible with our lack of reliable data as to the history of the American races and their relation to each other. The tribes whom we are accustomed to group under such heads as "Mound Builders" and "Cliff Dwellers" (for illustration see these titles), although far from being the earliest inhabitants of our continent, never produced any works that enter the domain of art, though some of the "pueblos" show careful construction and plan, especially in Arizona and New Mexico; for example, Casa Grande (q.v. for illustration); Chihuahua; and Bonito. The peoples of Maya and Nahuatl nationality who founded the confederacies of Mexico, Central America, Peru, and other South American States, developed an architecture that may fairly be compared with that of Farther Asia, especially India. But no sure historic records of the age of these monuments gives an earlier date than the Twelfth Century A.D.; though plausible conjecture goes back to the Fifth Century B.C. for the earliest Maya examples. The earliest ruins are those of the Mayas, and among them we can distinguish local variations and historic development; for example, those of Chiapas, of which the most important are at Palenque, differ from those in Yucatan, which are much later. The ruins at Copan, in Honduras, form the connecting link between the Palenque style and that found at Uxmal, Chichen-Itza, Izamal, and other ruined cities of Yucatan. Guatemala also has monuments of the Palenque, and later types, at Utatlan, Cahuinal, Tikal, etc. The fortified city of Tenampua, in Honduras, is especially interesting. It is important that the Maya ruins of Central America are the more monumental the nearer they approach the frontier of Yucatan. The arrangement of the buildings is according to one general scheme: they rise from a mound, surmounted by a platform on which the building or buildings stand. This mound is entirely or partly natural, cut into terraces about five feet high or lines of stone steps. The lines of the mound are made by rubble, and retaining walls, faced either with colored stucco, or large slabs (Palenque), or with dressed stone (Chichen-Itza and Uxmal). The separate buildings rise from a base in the form of a truncated pyramid, and the chambers and passages are covered with vaults formed of the triangular corbel arch of projecting horizontal courses. Among the most impressive structures are the pyramids; one at Izamal is between 700 and 800 feet long, and contains several chambers. They usually rose in front of each temple. These pyramids were crowned by shrines, and bear some resemblance to Buddhist buildings in India. The greatest variety of monuments is at Chichen-Itza. There was a lavish use of decorative sculpture either as integral part of the architecture, or in the form of accessory steles, pillars, obelisks, statues. The famous "Tablet of the Cross" from Palenque is the most tasteful simple piece. An idea of the way in which the Maya buildings were grouped is given by the ruins of Palenque, Umaland, and Chichen-Itza. For illustrations, see these titles.

The Mayas suffered from invasions of Nahuatl peoples in the Sixth Century A.D., but though more recent, the Nahuatl monuments appear not to have survived so well; perhaps because this people preferred the less durable material of adobes, cemented together with mortar, to the stonework of the Mayas. This is exemplified in the Pyramid of Cholula, originally crowned by a magnificent temple destroyed by Cortés. It measures 1440 feet square—an area nearly four times that of the Pyramid of Cheops; its height was 177 feet, and it was divided into four terraces. Ruins of debated character occur at Xochicalco, in Mexico, Huatusco, and Centla. Here, as with the Mayas, the truncated pyramid is the main form of substructure. It is curious that even less remains of the Aztec monuments, erected only during the two centuries preceding the Spanish Conquest. Probably it was because, being the centres of civilization at that time, they bore the brunt of Spanish vandalism, while the older cities, long since deserted, remained immune and often unknown. Perhaps slightly earlier than the Aztec domination are the cities of the Zapotecs in Central America, whose capital, Mitla, was captured and ruined by Aztecs c.1500 A.D. The palace at Mitla has called forth the most enthusiastic praise for the beauty of its masonry, the symmetry of its proportions, and the classic restraint of its ornament. This palace consists of an interior quadrangle, 130 x 120 feet, surrounded on three sides by mounds crowned by other buildings. It is built not entirely of dressed stones, as at Palenque, but of faced rubble, as in Yucatan. The main hall was supported by six columns, supporting heavy beams, a most unusual arrangement. It must be remembered that the manual labor of facing the masonry and executing the sculptured decoration in all these buildings of Central America and Yucatan, was vastly increased by the lack of metal implements. We finally come to Peru, which is studded with ruins of the greatest interest, bold in construction and massiveness, though lacking in that richness of sculptured ornament so characteristic of the styles thus far mentioned. Pachacamac, Chimu, Tiaguanaco, Titicaca, and Cuzco are the most important sites. The fortresses are of especial interest; also great engineering works, such as aqueducts, reservoirs, and bridges. The temples, called *huacas*, are composed of truncated pyramids, usually of stone. That of Obispo is 150 feet high, with a base 580 feet square, covering eight acres. Some of these pyramids served as sepulchres, like one near Obispo, surrounded by



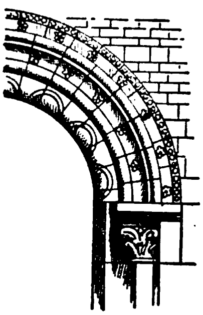
MEXICAN ARCHITECTURE
THE TEMPLE OF PALENQUE—RESTORATION

an inclosing wall 14 feet high. Another at Moche was 800 x 470 feet, and about 200 feet high. The palaces were built of adobes, and were formed of an irregular series of buildings on a terraced mound. That at Chimu is typical. The ruins at Tiaguanaco are, perhaps, the earliest, and belong to a civilization prior to that of the Incas. Most remarkable are the numerous erect monoliths comparable to the Celtic monoliths in the Mediterranean (e.g. Malta), and in England (e.g. Stonehenge). For books of reference, consult the bibliography under Archæology, American.

ARCHITRAVE, är′kĭ-trăv (Gk. ἀρχι-, *archi-*, chief + Lat. *trabs*, beam). The lowest part of the entablature (q.v.), or that which rests immediately upon the columns, also called the epistyle. It also designates, in the case of a square opening, the beam over the window or door-jambs. It is even applied to a curved or vertical molding in connection with such openings or entablatures, being in the first case the same as an archivolt. For illustration, see Entablature.

ARCHIVES, är′kīvz. See Records, Public.

ARCHIVOLT, är′kĭ-vōlt (It. *archivolto*, from *archi*, chief + *volto*, vault, arch). The stone or marble band, corresponding to the architrave, which frames a curved opening. In early Christian architecture it is extremely simple, but in the Middle Ages it grows into an elaborate bundle of moldings, or sculptured ornament.



ARCHIVOLT.

ARCHLUTE, ärch′lūt′ (It. *archiliuto*). A large double-necked lute about 4 feet 5 inches long, used in the Seventeenth Century for the lowest part in instrumental music and accompaniments. The neck contained two sets of tuning-pegs, the strings were of catgut or metal, and the compass was two octaves, from C below the bass clef. The sound-board, with a circular hole, was of pine, while the back was made of strips of pine and cedar glued together and richly ornamented. See Lute; Theorbo.

ARCH OF ARCADIUS, HONORIUS, AND THEODOSIUS. See Theodosius, Arch of.

ARCH OF AUGUS′TUS. See Augustus, Arch of.

ARCH OF CLAU′DIUS. See Claudius, Arch of.

ARCH OF CON′STANTINE. See Constantine, Arch of.

ARCH OF DRU′SUS. See Drusus, Arch of.

ARCH OF HA′DRIAN. See Hadrian, Arch of.

ARCH OF JA′NUS QUAD′RIFRONS. See Janus Quadrifrons, Arch of.

ARCH OF SEPTIM′IUS SEVE′RUS. See Septimius Severus, Arch of.

ARCH OF TI′TUS. See Titus, Arch of.

ARCH OF TRA′JAN. See Trajan, Arch of.

ARCHON, är′kŏn (Gk. ἄρχων, *archōn*, literally leader, chief, from ἄρχειν, *archein*, to begin, lead, rule). The highest magistrate in Athens and other Greek cities. As the name shows, it denotes the one in power as opposed to 'king' (*βασιλεύς*). The Athenian archon is the only one whose history and duties are well known. There were nine archons at Athens, later chosen yearly by lot. The first was called "The Archon," or, as he gave his name to the year, Archon Eponymos; the second was the Archon Basileus, the third Archon Polemarchus, the other six were Thesmothetæ. During the Athenian democracy the archons were law-officers, the Archon Eponymos having charge of suits relating to the family, the Basileus of religious cases, the Polemarch of those involving foreigners, and the Thesmothetæ of a variety of other cases. According to Athenian tradition the last king, Codrus (q.v.), was succeeded by a life archon, but in B.C 752 the office was limited to ten years, and in B.C 713 opened to all nobles (Eupatridæ), and in B.C. 683 it was made annual, and in B.C. 457 opened to citizens of the three upper classes, and in practice to all citizens. The historical development seems rather to have been the reduction of the power of the Basileus, by giving first the military command to a new officer, Polemarch ('general'), and then adding a civil ruler as the civil head of the State, thus restricting the 'king' to religious functions. The military command was still held by the Polemarch at the time of the battle of Marathon (B.C. 490). The same Greek word is often used to denote rulers of other official titles.

Among the Jews of the Dispersion the title was used to denote members of the official body exercising control over their independently organized communities, as at Alexandria, Antioch, and Rome. In the New Testament it is used specifically by members of the Sanhedrin (e.g., Nicodemus, John iii. 1) of the officer presiding over the synagogue (e.g., Jaïrus, Luke viii. 4); and generally for rulers, magistrates, and men of influence. In the sense of ruler it is applied to Christ in Rev. i. 5: "Ruler [archon] of the kings of the earth," and to Satan in John xii. 31: "The prince [archon] of this world." In the mystical jargon of the Gnostics, the term archon was frequently employed; and hence one of their sects, especially opposed to Judaism, received the name Archontics. See Gnostics; Heresy; Heretics.

ARCH-PRIEST, ärch′prēst′. A name dating from the Fourth Century, and equivalent to the Greek *prōtopresbyter*. It was usually applied to a senior priest attached to a cathedral, whose duties were to assist the bishop, to act as his substitute in the performance of the Church offices, and to have general oversight of the cathedral clergy; also to those placed in large towns to occupy similar positions respecting the local clergy. This title in later times gave way to that of *dean*, as applied to the former and *rural dean*, to the latter class of arch-priests.

ARCH′WAY (*arch* + *way*). A passage closed on both sides and covered by a vault, or at least ending in arches at each end, and differing from an arcade, which is open at least on one side in a series of arches.

ARCHYTAS, är-kī′tas (Gk. 'Αρχύτας). The son of Mnesagoras, or Hestiæus, of Tarentum, a distinguished philosopher, mathematician, general, and statesman. He lived in the first half of the Fourth Century B.C., and was thus a contemporary of Plato, whose life he is said to have saved by his influence with the tyrant Dionysius. He was seven times elected general of his city, though it was customary for the office to be held for one year only. His connection with Plato belongs to the time of the latter's visit to lower Italy. He was drowned on the Apulian coast, and is said to have been buried near Matinum, in Apulia. Archytas was a man marked for his morality, self-control, and gentleness. As a philosopher, he belonged to the Pythagorean School. His services to the science of mathematics were many and important, and he passed as the founder of scientific mechanics. He was the first to distinguish harmonical progression from arithmetical and geometrical progression; he also solved the problem of doubling the cube. (See CUBE.) Among his mechanical contrivances was a flying pigeon made of wood. He is said to have invented the pulley. As an astronomer, he taught that the earth is a sphere rotating on its axis once in twenty-four hours, and that the heavenly bodies move about it. He further made original contributions to the knowledge of musical tones. In a philosophical way he must have influenced Plato not a little, and perhaps Aristotle. The mathematical fragments of Archytas have been carefully collected by Blass in *Mélanges Graux* (Paris, 1884). The other fragments which are attached to the name of Archytas, and which relate to ethics, logic, and physics, are probably for the most part not genuine. They are to be found in Mullach, *Philosophorum Græcorum Fragmenta*, Vol. I. (Paris, 1860-81); also the two letters of Archytas, one to Dionysius and the other to Plato, and the work *On the Ten Categories*, are spurious.

ARCHYTAS OF AMPHISSA (c.300 B.C.). A Greek poet, to whom some hexameter lines are attributed by Plutarch, Athenæus, and Stobæus. He is spoken of by Diogenes Laërtius as an epigrammatist upon whom Bion wrote an epigram. Nothing is known of the details of his life and work beyond the scanty information given by the authors named.

ARCIF'ERA (Lat. *arcus*, bow + *ferre*, to bear, carry). A group of anurous amphibians, the toads, having a tongue, with the clavicle and coracoid of each side connected by a longitudinal arched cartilage, allowing contraction and expansion. See TOAD.

ARCIS-SUR-AUBE, är'sē'sụ'-rōb' (Fr., Arcis on the Aube). Capital of the arrondissement of the same name in the French Department of the Aube, and remarkable on account of the battle fought here, March 20-21, 1814, between Napoleon and the Allied forces under Prince Schwartzenberg (Map: France, L 3). The battle, beginning with several skirmishes on the first, and ending in a general engagement on the second day, when the French retreated over the Aube, was not in itself very important. But Napoleon now formed the plan of operating in the rear of the Allies, and left the road to Paris open; assuming that they would not venture to proceed without attempting first to secure their rear. The Allies marched, nevertheless, on the capital, and thus decided the campaign. Arcis-sur-Aube is the birthplace of Danton. Its industries are silk and cotton spinning, stocking weaving, and it has also an important trade in grain. Pop., 1901, 2774.

AR'CITE. One of the two Theban knights who, in Chaucer's *Knight's Tale*, are at first close friends, but who, having seen the lovely sister-in-law of Theseus from their prison window, both claim her as mistress, and later joust fiercely for her hand, in which tourney Arcite is slain.

ARC LAMPS AND ARC LIGHT'ING. See ELECTRIC LIGHTING, paragraph *Arc Lamps*.

AR'CO, CARLO D' (1799-1872). An Italian art critic and historian. He was born at Mantua, studied painting at Florence and Rome, and as a result of a study of the galleries of Mantua published, in 1827-37, a series of descriptions of paintings, with engravings from drawings by himself. His most important work was *Delle arti e degli artifici di Mantova* (2 vols., 1857-59), a study of Mantuan art from the earliest times. His further publications include *Studj intorno al municipio di Mantova* (1871-74) and a *Chronicon Mantuanum*, 1095-1299.

ARCO DEI LEONI, dā'ē lā-ō'nē (It., Arch of the Lions). A gate in Verona, built supposedly in the third century A.D. Originally it had two arches; but at present only one remains. It is a dainty bit of architecture, with Corinthian columns, above which is a story pierced with three openings between pilasters. It is situated in the Via Leoni and is coeval with the Porta de' Borsari.

ARCO DELLA PACE, dĕl'lā pä'chā (It., Arch of the Peace). A large arch of white marble, with smaller ones on either side, surmounted by a bronze figure of Peace driving a six-horse chariot. It was erected in Milan, Italy, in 1807, in honor of Napoleon, but not completed until 1838, and was consecrated to Peace in 1815.

ARCOLE, är'kō-lā. A village of Venetia, situated on the left bank of the Alpone, a tributary of the Adige, and famous for the victory gained by Bonaparte over the Austrians under the chief command of Alvinczy, November 17, 1796. From the 14th to the 16th the French vainly attempted to rush the bridge across the Alpone held by the Austrians under Mittrowsky; on the 17th they forded the stream below the bridge and took the enemy in the rear. In the series of battles around Arcole the Austrians lost eighteen thousand men, and, as a result of the battle, they were compelled to abandon the relief of Mantua, which was besieged by the French.

ARÇON, är'sôN', JEAN CLAUDE D' (1733-1800). A distinguished French engineer. He was born at Pontarlier, and was educated as an engineer at the military school at Mézières. During the Seven Years' War, he acquired considerable reputation, especially in the defense of Cassel, his work being distinguished by a remarkable fertility of invention. His most famous scheme was a system of floating batteries designed to reduce Gibraltar (1780), then in the hands of the English, and defended by Governor Elliot. The attempt, however, was not successful, mainly because of the fact that his efforts were indifferently supported. When the French under Dumouriez overran Holland, Arçon took several strongly fortified places, among others, Breda. After his retirement from the army, he was called to the Senate (1799). His important work is *Considérations militaires et politiques sur les fortifications* (Paris, 1795).

ARCO'NA. See ARKONA.

ARCOS DE LA FRONTERA, är'kôs dâ lâ frôn-tā'râ (Sp., Bow of the Frontier, alluding to its being built in bow-shape and to its position on the frontier). A town on the right bank of the Guadalete, in the province of Cadiz, Spain (Map: Spain, C 4). It is situated on a conical height 544 feet above sea-level, and is a remarkably picturesque city with steep, crooked streets. Above the city stands the old castle of the dukes of Arcos, now in ruins. Beyond appear the Ronda Mountains. There are seven monasteries, two parish churches, with the main church of Gothic style, interesting among its buildings. The manufactures include leather, mats, thread, and rope. There is considerable trade in oil, wine, and fruit. Pop. 1900, 14,393.

Arcos is the Arcobriga (Celt. *briga*, town) of the Romans. It was wrested from the Moors by Alfonso the Wise, and strongly fortified as a frontier town, in 1264.

AR'COSO'LIUM (Lat. *arcus*, arch + *solium*, seat, chair of state). A name given to the niches, surmounted by an arch, that were used, for example, in the early Christian catacombs, for the burial of the more illustrious dead. They usually contained a carved marble sarcophagus, and were ornamented with frescoes.

ARCOT, är-kŏt' (Tamil *Arkat*, Six Woods). A city in the presidency of Madras, India, the capital of the district of North Arcot, on the right bank of the Palar River, 65 miles west of Madras (Map: India, C 6). It is a railway junction, has a military cantonment, contains some mosques in a tolerable state of repair, and the ruins of the Nawab's palace. Of great antiquity and mentioned by Ptolemy, it is noteworthy because of its history, the most brilliant incident of which was its capture and defense by Clive (q.v.), in 1751. The walls of the famous fort now serve as a dyke which protects the city against periodical inundations. Pop. 11,000.

ARC'TIC (Gk. *ἀρκτικός*, *arktikos*, northern, from Gk. *ἄρκτος*, *arktos*, bear, north). A term meaning "lying near the constellation of the Bear." The Arctic Circle is a circle drawn round the North Pole, at a distance from it equal to the obliquity of the ecliptic, or 23½°. The corresponding circle round the South Pole is the Antarctic Circle. Within each of these circles there is a period of the year when the sun does not set, and another when it is never seen, this period increasing as we approach the pole itself. At the pole it is six months in length, if we neglect the effects of refraction (q.v.).

ARCTIC CUR'RENT, HIGH'LANDS. See ARCTIC REGION.

ARCTIC DISCOV'ERY. See POLAR RESEARCH.

ARCTIC O'CEAN. See ARCTIC REGION.

ARCTIC PLANTS. See ARCTIC REGION.

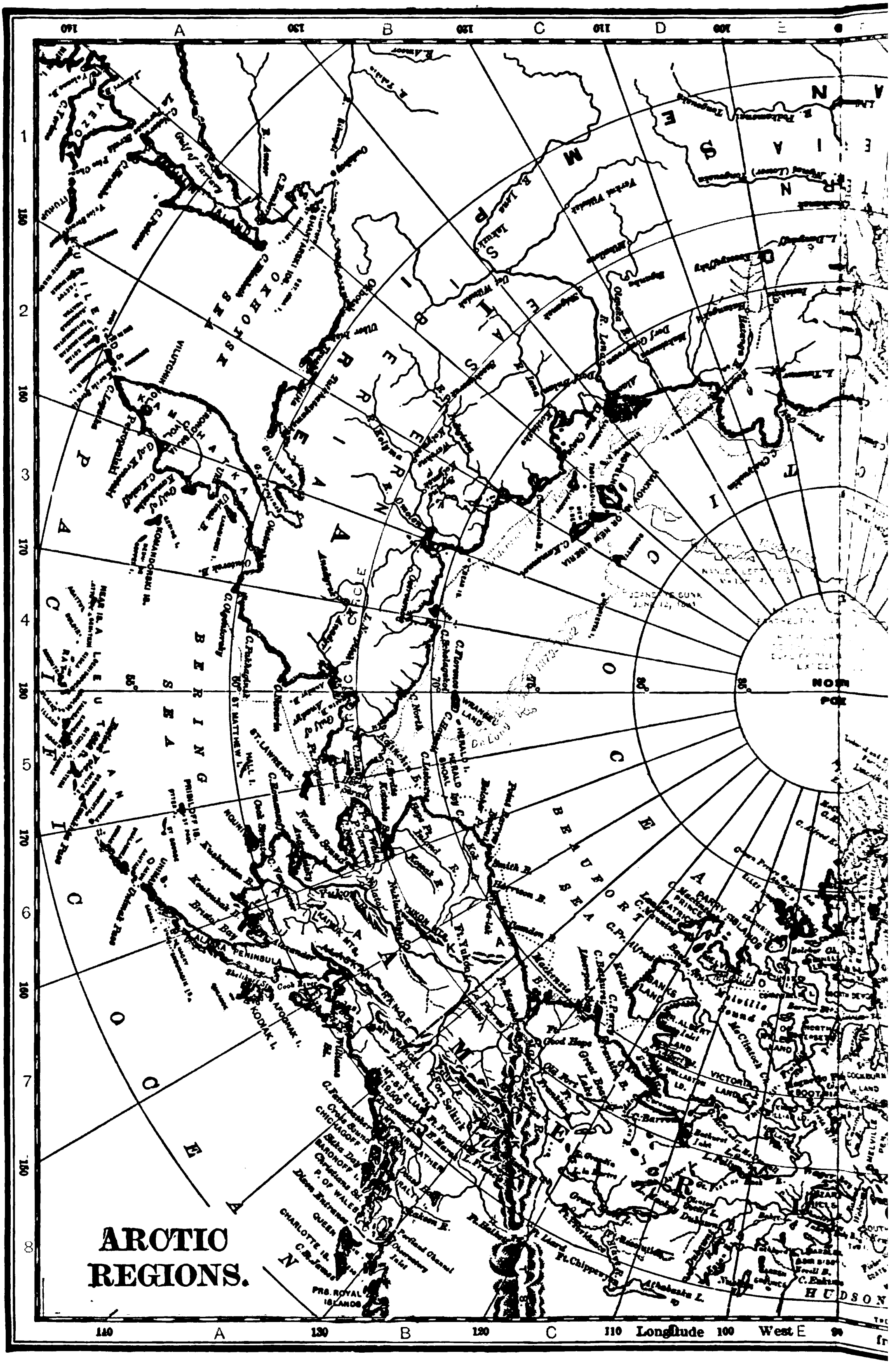
ARCTIC RE'GION. Broadly speaking, that portion of the surface of our globe which surrounds the North Pole within the limits of the Arctic Circle, and thus, extending twenty-three and one-half degrees in every direction from the pole, covers an area of 8,200,000 square miles. It includes the northern coast-lands of Europe, North America, and Asia, and the outlying islands to the north of these continents, as well as the middle and northern parts of Greenland, the northern part of the Atlantic Ocean, and the whole of the Arctic Ocean. The northern islands comprise the great archipelago north of the continent of North America, including the Parry Islands, Baffin Land, Prince Albert Land, Banks Land, Prince of Wales Land, North Somerset, Grinnell Land, etc., and the islands north of Europe and Asia; the Spitzbergen group, Nova Zembla, the Franz-Josef group, and the New Siberian group. It is a region of snow and ice; for months in the winter the sun is below the horizon, and though for other months in summer it never sets, its heat is not strong enough in most quarters to reduce the quantity of snow and ice which forms in the cold season. The longest day and the longest night at latitude 70° are about two months each; ten degrees farther north they are about three months each; at the pole they divide the year almost equally.

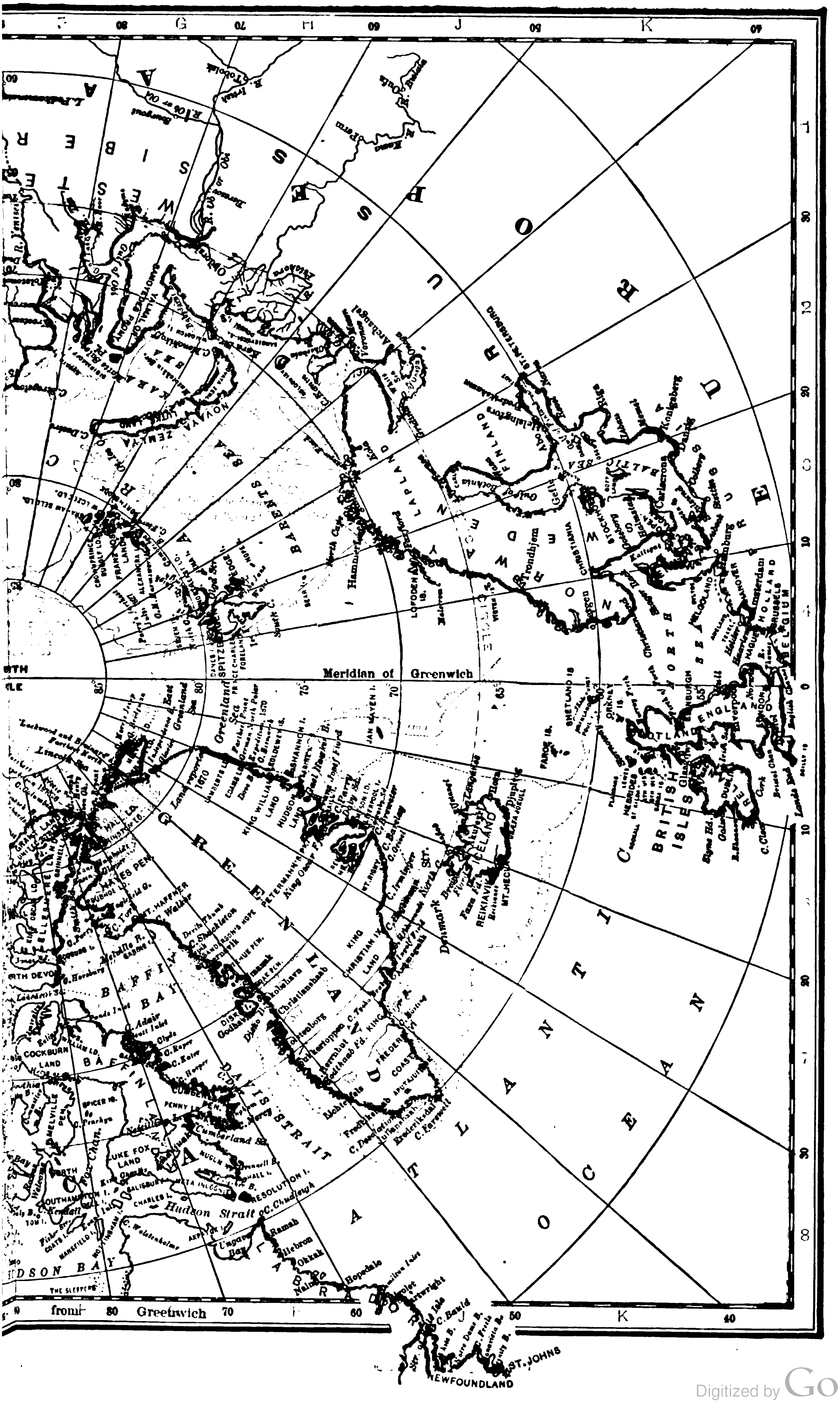
TOPOGRAPHY. The land surface of the Arctic region has been as yet but incompletely explored, although the unremitting interest in Arctic exploration is gradually adding to our knowledge of its extent and details. The loftiest region is Greenland, along the east and west coasts of which there are mountains rising from 3000 to 8000 feet above sea level, culminating in Petermann Peak, with an estimated altitude of 11,000 feet. The name "Arctic Highlands" was given to that portion of the American Continent which lies between Hudson's Bay and the mouth of the Mackenzie River, reaching far below the Arctic Circle. The district lies partly within and partly without the barren or treeless stretches of northern North America. The southern portion has elevations of 1700 to 2000 feet above sea level. The portion north of Great Slave, Great Bear, and Athabasca Lakes has a gentle and regular slope toward the Arctic Ocean. The usage of the term "Arctic Highlands" may, perhaps, be extended so as to include the highlands west of Smith Sound. The name was also applied by Ross in 1818 to the region around Cape York (latitude 76° to 78°, longitude 67° W.), in Greenland; and the most northern Eskimos, who live on the seacoast at the foot of these mountains, have until recently borne the name of "Arctic Highlanders," given to them by Ross. The northern part of Seward Peninsula is characterized also by a broken topography, with mountains rising 5000 feet or more above sea level. Banks Land and other large islands off the coast of the North American Continent, including Baffin, Ellesmere, Grinnell, and Grant Lands, are comparatively low, with rounded mountains in the interior. In Baffin Land the central plateau is from 600 feet to 800 feet above the sea, and isolated mountains attain a height of 2000 feet. In the eastern part of Siberia the surface is broken by low mountain ranges and by wide river valleys. The portion of Siberia lying west of the Yenisei River, however, is a low, almost unbroken plain, covered with a dense growth of moss, and containing numerous and extensive swamps, features that are comprehended under the general term of *tundra* (q.v.). Portions of Franz-Josef Land and Crown-Prince Rudolf Land (latitude 80° to 83°) are elevated, the mountains and plateaus rising 2000 feet or more above the sea. Upon these plateaus, and that of Spitzbergen, and particularly upon that of Greenland, extensive "ice-caps" have formed. The outer edges of these masses of ice are forced through the fiords in the form of glaciers, which discharge icebergs. See GLACIER, and the general article GEOLOGY.

GEOLOGY. The geology of the Arctic lands presents a great variety of features, which, however, are comparable in general to those exhibited in more southern latitudes. Extensive coal beds and numerous fossil remains in sedimentary strata bear evidence that the conditions prevailing in former ages were favorable for the development of a diversified fauna and flora, such as do not at present exist. The Carboniferous strata are the most significant as to the past climatic conditions obtaining in this region. They have been found in Banks Land, North Devon, and Spitzbergen. Coal beds and strata of the Tertiary Age have been discovered in Grinnell Land, and similar deposits are known to occur as far north as 82°, in which poplar, pine, birch, and hazel flora are represented. In Spitzbergen a Carboniferous flora has been obtained, comprising no less than twenty-six species, some of which are new, but of which others are forms common to the coal measures of England and the United States. Greenland (q.v.) consists principally of gneisses, schists, and granite, with later intrusions of basalt, and is noteworthy as the source of the mineral, cryolite. Most of the islands off the North American Continent are made up of crystalline rocks and Paleozoic sediments, of probably Cambrian and Silurian Age. The northern part of Seward Peninsula has been found recently to be composed of metamorphosed sediments of undetermined age, and of Cretaceous limestones. The great island groups north of Euro-Asia, including Franz-Josef Land, are formed of early Paleozoic and pre-Cambrian rocks overlaid by basalt. Very little is known as to the geological features of northern Siberia.

THE ARCTIC OCEAN is the body of water encircling the North Pole, and included between the northern boundaries of Europe, Asia, North America, Greenland, and the north Atlantic Ocean above the Arctic Circle, with which latter ocean it is in open connection, while it is in communication with the Pacific Ocean only through the narrow Bering Strait. It drains a vast area, including the northern parts of North America and of Asia. The great rivers, Obi, Yenisei, and Lena, in Asia, and the Mackenzie, in Canada, empty into this ocean. Its area is estimated at between 4,000,000 and 5,000,000 square miles. How much of this area is covered by land is uncertain; but the considerable depth of soundings taken by Arctic explorers would seem to indicate an extensive polar sea. It is uncertain whether any important land areas exist in the region that stretches from the pole southward, to the northern point of the archipelago above Greenland, to the mouth of the Mackenzie, to Bering Strait, to the northern point of Siberia, and to the northern point of Franz-Josef Land. The water region immediately surrounding the pole is covered with great fields of ice, which are frozen together in winter, but become separated to a greater or less degree (especially at the edges where ice floes are formed) during the summer. This ice area is called the ice-pack, and it extends somewhat to the southward of latitude 75° N. above Bering Strait and the adjoining American and Asiatic coast, between the limits of longitude 160° E. and 130° W.; to the westward and eastward of this region the pack-limit retreats northward; and in longitude 120° W., it is found at about latitude 78° N.; in longitude 90° W., at about latitude 78° N.; in longitude 85° W., at about latitude 81° N.; in longitude 50° W., at about latitude 83° N. On the east coast of Greenland the ice-pack descends to latitude 78° N., to retreat again to 82° or 83° N., north of Spitzbergen and Franz-Josef Land, where this latitude is preserved as far east as longitude 100° east of Greenwich, when the detour toward the south begins, which reaches its limit at about longitude 173° E. This ice is kept in sluggish motion, principally by the winds, in such a manner that a vessel lodged in the ice at a point north of Alaska, or even of Siberia, would gradually drift toward the pole and, passing beyond that, would continue southward until set free from the ice near Spitzbergen or Greenland. Nansen made such a drift in 1893-96. The depth of the Arctic Ocean is variable, being very shoal (only a few hundred feet deep) north of western North America and eastern Asia, where, however, measurements have not been made above latitude 75° north, and very deep (7000 to 15,000 feet) near where its waters join the North Atlantic. Northward of the continent of Europe the depth is from 600 to 1200 feet, and northward of Spitzbergen and Franz-Josef Land 10,000 feet. The Arctic Ocean is apparently affected by tides, in which the monthly variations are more important than are the semi-diurnal, but both these are masked by the influence of the winds and the ice. The assumption that a great portion of the Arctic Ocean has for a long time been covered with solid pack of ice has suggested for it the name of Paleocrystic Sea, or the Sea of Ancient Ice.

ARCTIC CURRENTS. The open connection between the North Atlantic and the Arctic Oceans offers an opportunity for a free interchange of waters between the two. On the east side of the North Atlantic the drift of the surface water is northward, and on the west side the current flows southward. This latter, called the Arctic Current, passes from the Arctic Ocean through the Irmingen Sea of Nordenskjöld, between Iceland and Greenland; thence along the eastern coast of Greenland; rounds Cape Farewell, and flows up Davis Strait to about latitude 64° N. Here it probably turns toward the west and joins the Labrador Current. There is another movement of water southward from the Arctic Ocean through the straits and bays which communicate with Baffin's Bay. The Labrador Current flows southward along the west coast of Baffin's Bay, past Labrador and Newfoundland, until it dips into the eastward drift of the warmer waters off the Banks of Newfoundland, where the divers currents prevailing are but feeble. It has been supposed that a part of this current continued southward along the Nova Scotian and New England coast, but some other explanation must be offered for the cold current which exists on that coast. The Labrador Current, which has a very low water temperature, carries with it icebergs and floes, which eventually disappear by melting in the vicinity of Cape Race. In this latter region heavy fogs prevail whenever winds from the south carry moist, warm air over the


ARCTIC REGIONS.
OKHOTSK SEA
BERING SEA
PACIFIC OCEAN
ARCTIC OCEAN
BEAUFORT SEA
SIBERIA
KAMCHATKA
ALASKA
ALEUTIAN ISLANDS
KURILE ISLANDS
YEZO
SAGHALIEN ISLAND
NEW SIBERIA
WRANGEL LAND
HERALD I.
ST. LAWRENCE I.
ST. MATTHEW I.
PRIBILOFF IS.
NUNIVAK I.
KODIAK I.
ALASKA PENINSULA
BANKS LAND
VICTORIA LAND
PARRY ISLANDS
PRINCE PATRICK I.
MELVILLE I.
Gulf of Tartary
Gulf of Anadyr
Norton Sound
Bristol Bay
Cook Inlet
Mackenzie R.
Yukon R.
Great Bear Lake
Great Slave L.
Athabasca L.
L. Baikal
R. Lena
Kolyma R.
R. Amoor
QUEEN CHARLOTTE IS.
PRS. ROYAL ISLANDS
HUDSON
NORTH POLE
JEANNETTE SUNK JUNE 12, 1881
140
A
130
B
120
C
110
D
100
E
90
1
2
3
4
5
6
7
8
150
160
170
180
170
160
150
80°
70°
Longitude
West



G
H
J
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80
70
60
50
40
Meridian of Greenwich
from
Greenwich
SIBERIA
RUSSIA IN EUROPE
ATLANTIC OCEAN
NOVAYA ZEMLYA
KARA SEA
BARENTS SEA
SPITZBERGEN
FRANZ JOSEF LAND
Greenland Sea
GREENLAND
JAN MAYEN I.
ICELAND
REIKIAVIK
Denmark Strait
DAVIS STRAIT
BAFFIN BAY
BAFFIN LAND
Cumberland Sd.
RESOLUTION I.
Hudson Strait
HUDSON BAY
LABRADOR
NEWFOUNDLAND
ST. JOHNS
FAROE IS.
SHETLAND IS.
ORKNEY
HEBRIDES
BRITISH ISLES
SCOTLAND
ENGLAND
IRELAND
LONDON
NORTH SEA
HOLLAND
BELGIUM
HAMBURG
NORWAY
SWEDEN
CHRISTIANIA
STOCKHOLM
Trondhjem
LAPLAND
FINLAND
Gulf of Bothnia
BALTIC SEA
Riga
Konigsberg
Danzig
Archangel
North Cape
Hammerfest
LOFODEN IS.
KING WILLIAM LAND
KING CHRISTIAN IX LAND
KING FREDERICK VI COAST
C. Farewell
Godthaab
Disko I.
Upernivik
Smith Sd.
GRINNELL LAND
GRANT LAND
ELLESMERE LAND
NORTH DEVON
COCKBURN LAND
MELVILLE PEN.
SOUTHAMPTON I.
Ungava Bay
Hopedale
Nain
Okkak
R. Obi
R. Yenisei
Tobolsk
Perm
C. Chelyuskin

cold water. There is another drift of water northward through Bering Strait, but its volume is not great.

Climate. The annual average temperatures of the Arctic region are below 32° F. On the island of Jan Mayen, 29° F.; in Spitzbergen, 22° F.; Sea of Kara, 13° F.; Point Barrow, 8° F.; Lady Franklin Bay, 2° F. In Spitzbergen the average temperatures are in July 40° F.; in December, — 2° F.; those of Lady Franklin Bay, in July, 37° F.; and February, — 39° F. In other localities, Nares experienced a minimum temperature of — 74° F.; Greely, a minimum of — 62° F.; Nansen, — 52° F., and De Long, — 72° F. The distribution of average temperatures for January shows a great area extending northward of the central and eastern part of the Asiatic and American continents, from about latitude 75° to beyond the pole, over which the average temperature is below — 35° F., from which central area the temperatures increase in all directions, save on one side, to the following temperatures along the Arctic Circle: —30° F. on the North American Continent, + 30° F. in Iceland and the North Atlantic, + 5° F. in north Europe, — 10° F. at Bering Strait, — 31° F. in eastern north Asia; but there is actually a decrease of temperature from the Polar region to —60° F. in central north Asia, which is the cold pole of the globe. The distribution of average temperatures for July shows a circumpolar area of + 35° F., which lies mostly north of latitude 80°, between North America and Europe, but lies below 80° latitude elsewhere, and descends to latitude 70° in northern Alaska. From this central cold area the temperatures increase in all directions to the following values along the Arctic Circle: Western North Atlantic, + 45° F.; eastern North Atlantic, + 50° F.; northern Europe, + 55° F.; northern Asia, + 60° F.; Bering Strait, + 45° F., and northern North America, + 55° F. The winds in January near the pole are generally from the north in the neighborhood of Baffin's Bay and northward of North America, but north of Asia they appear to be from the south, veering toward the east over northern Europe. In July the winds are from the southwest in Baffin's Bay, from the northwest in the archipelago northward of North America, from the east north of Alaska, from the northeast north of Asia, from the north or northeast north of Europe, and from the north-northeast or northwest in the North Atlantic. The cloudiness averages probably between 40 and 50 per cent. in January, and between 60 and 70 per cent. in July. The annual precipitation is in general less than 10 inches in the Arctic regions, and most of it falls as snow.

The temperature of the Arctic waters varies from several degrees above freezing to even slightly below freezing at and near the surface; but from a distance of 500 or 600 feet below the surface down to great depths the temperature is about 1° F. above freezing.

Inhabitants. Ranging across the North American continent, above the Arctic Circle, from Alaska to the eastern end of the archipelago, and also settled on both the west and the east coasts of Greenland, are tribes of Eskimos, a race of aborigines, believed by certain authorities to be of Mongolian origin; by other authorities to be derived from American Indian stock. They live by hunting and fishing, speak an agglutinate language, have no written characters and no well-defined form of government. Whether they have a well-defined form of religion has not been definitely determined. Peary, who examined with some care the isolated tribe in the Whale Sound region of Greenland, reports that the nearest approach to religion is "simply a collection of miscellaneous superstitions and beliefs in good and evil spirits." Other observers, however, report that they have some belief in a future life. For further information see Eskimo; Greenland; Alaska, etc. The other important Arctic inhabitants are the Lapps and Finns, and a series of tribes, probably of Mongolian origin, living in the northern part of Siberia; the Samoyedes, Tunguses, Yakuts, Yukahires, and Tchuktchis. These tribes are supported, some by hunting and fishing, but most by herds of reindeer, which find sustenance in the moss of the tundra. But all the tribes are more or less nomadic in their habits—even those that build villages of timber. Those that depend for livelihood upon their herds of reindeer are sometimes forced to wander to fresh tundra; those that depend upon hunting and fishing follow the game from place to place.

Flora and Fauna. The general similarity of modern life-forms throughout the Arctic lands, which has been noted by Heilprin and others, is interesting from a geological standpoint, in that it shows that areas now separated by stretches of water were probably connected in past ages. It seems quite certain that the area now occupied by Bering Sea and Bering Strait was in comparatively recent times a land surface, and that there was a migration of fauna and flora between the American and the Euro-Asian continents. However, the uniformity of conditions over wide areas is also undoubtedly a factor causing similarities of life-forms, as is shown by the fact that isolated Antarctic islands have closely similar floras.

Arctic Plants. In many respects these plants, whose natural habitats are in high latitudes, resemble alpine plants (q.v.), and, like them, form one of the three climatic groups of xerophytes (q.v.). Dwarf growth is one of the chief characteristics of Arctic vegetation, and is remarkably well illustrated in a juniper stem reported by Kihlman: The stem was but 3⅛ inches thick, and yet showed 544 growth rings. Plants that grow to a height of one or two feet in Sweden are but one or two inches high in the far North. As in the case of alpine plants, reduction is confined to the stems and leaves, the roots and flowers being as large as in warmer climates. Cushion and rosette plants are well developed. The leaf structure is highly xerophytic, leathery and thick-skinned evergreen leaves being particularly abundant.

The Arctic life conditions have been especially well described by Kihlman (*Pflanzenbiologische Studien aus Russisch-Lapland*, 1890, etc.). The cold and darkness of the long winter nights have but little influence on the vegetation. Of greater importance are the short vegetative period, which excludes many plant species from life in Arctic regions, and the prevalence of dry winds at times when transpiration losses cannot be made good. Kihlman thinks that this latter factor is the chief cause of Arctic phenomena. The absence of trees, then, is due not to the shortness of the period of vegetation, nor to the cold, but to dry winds; this is shown by the fact that trees thrive in the coldest known place in the world (Verkhoyansk, Siberia), and also by the fact that the height of shrubs is determined by the level of the snow in winter. The continuous though not intense light of Arctic regions checks growth, but favors photosynthesis. One of the peculiarities of Arctic plant life is that there are no gradual seasonal transitions. The buds are largely laid down in the preceding season, and spring into active life at once; growth is checked with equal suddenness in the fall.

DRABA ALPINE

Showing the densely compacted cushion-form of Arctic-alpine plants.

The Arctic differs radically from the temperate zone in that plant structures are xerophytic, regardless of water and soil conditions. In fact, one may refer all of the Arctic vegetation to one great plant formation, the tundra (q.v.). While Arctic plants closely resemble alpine plants ecologically, there are interesting floristic differences. Alpine plants (q.v.) are noted for their endemism (q.v.), while Arctic plants are similar over wide areas. Indeed, the Arctic floras of Europe and America are almost identical.

About seventeen hundred species of plants have been found in the Arctic region. In the zone nearest the circle grow a few trees, mainly junipers, dwarf willows, and birches. The tree line in the Samoyed region ends near the 67th parallel of latitude; at the Yenisei River, near the 65th parallel; at the Lena, near the 71st parallel; at the Mackenzie, near the 68th parallel; at Hudson Bay, it runs down to the 60th parallel; in Labrador, to the 52d parallel. In Greenland it lies near the 62d parallel. Flowering plants, grasses, mosses, and lichens extend to the most northern land seen by man. Examples of those found in all sections of the Arctic world are saxifrages (*Saxifraga oppositifolia* is ubiquitous), several varieties of ranunculus, potentillas, poppies (the Arctic poppy, *Papaver nudicaule*, is found even upon the crests of the cliffs in northern Greenland, where it thrusts its head through the edge of the ice-cap to reach the sunlight), drabas, cochlearia, etc. The country richest in variety is Lapland, where are found three-fourths of the species known in the Arctic regions. For the varieties characteristic of each country, see LAPLAND; GREENLAND; SIBERIA; ALASKA; SPITZBERGEN; FRANZ-JOSEF LAND; ELLESMERE LAND; GRINNELL LAND, etc. See also MUSCI; LICHEN; GRASSES; DISTRIBUTION OF PLANTS, etc.

ARCTIC MAMMALS. The similarity of species of Arctic mammals throughout the circle of the globe is even closer than that of plants. Of land mammals there are but few, and many of these are of the same species wherever found. The polar bear (*Ursus maritimus*) has the highest range. Specimens have been found upon the ice-pack north of every known land. The bear, however, is never found far from the coast, either inland or at sea. (See BEAR.) The Arctic fox (*Vulpes lagopus*) has almost as high a range, and is also found throughout the entire Arctic land area. The lemming is found in every Arctic country except Franz-Josef Land. The reindeer (*Rangifer tarandus*) is found around the globe occasionally as far north as about the 79th parallel, but does not inhabit the great islands in the Arctic Ocean. The musk-ox (*Ovibos moschatus*) has been common within the memory of man as far west as Point Barrow; but at present its range extends from the Mackenzie River east across the continent to Grinnell Land, and again across the northern part of Greenland. The Arctic hare (*Lepus glacialis*) is found in the northern part of North America and of Greenland, and in these regions it reaches the highest known land. Among the other Arctic land animals are the wolverine or glutton (*Gulo arcticus*), which is found in North America and is reported to have existed in Greenland, though such reports lack scientific verification; the Arctic wolf; and the Eskimo dog, which is supposed by most authorities to have been derived from the wolf by taming.

The most important of the sea-mammals are the whales and seals. The right whale (*Balænus mysticetus*) is found in the waters east of Greenland, in Baffin's Bay, and again north of Bering Strait. The range of individuals is exceedingly wide; a whale bearing a Greenland harpoon has been found in the Bering Strait region. The razor-back, the hump-back, and the bottle-nose, the grampus, the white whale, and the narwhal, are also found in the Arctic Ocean. See WHALE.

Among the pinnipeds, the most remarkable is the walrus (q.v.), which formerly inhabited the seas near the coasts of all Arctic lands, but on account of slaughter by fishermen for ivory, skin, and oil, has been driven from Europe and from the southern part of Baffin Bay. The North Atlantic species (*Odobænus rosmarus*) is still plentiful in the Smith Sound region and in Spitzbergen and Franz-Josef Land, and the Pacific species (*Odobœnus obesus*) is found on the northern coast of Alaska and Kamchatka. Among species of hair seals which inhabit the Arctic seas, the most important is the *Phoca fœtida*, whose range covers the Arctic regions near the shores and ice-fields, and extends south to Labrador, the Orkneys, the Hebrides, the gulfs of Bothnia and of Finland, and along the coasts of Siberia and Alaska, into Bering Sea. The harp seal (*Phoca grœnlandica*) and the bearded seal (*Phoca barbatus*), which is the largest of the North Atlantic pinnipeds next to the walrus, also have a circumpolar distribution. The bladder-nose or hooded seal (*Systophora cristata*) ranges from Greenland to Spitzbergen and along the northern coast of Europe. For other seals, see the article Seal.

Arctic Birds. Birds are very plentiful throughout the whole of the Arctic region. The little auk (*Mergulus alle*) and the guillemot (*Uria arra*) are found in thousands in whatever region there are cliffs to serve as nesting spots. Ravens (*Corvus corax*), snow buntings (*Plectrophenax nivalis*), and sandpipers, have been seen in the remotest northern land regions. The snowy owl (*Nyctea nivea*) and the falcon, though in certain regions rare—as, for instance, Greenland and Franz-Josef Land—still inhabit all Arctic lands. Various species of gulls—Ross's gull (*Rhodostethia rosea*), the glaucus gull (*Larus glaucus*), the ivory gull (*Pagophila eburnea*)—also range very far north; Nansen saw Ross's gulls and ivory gulls upon the ice-pack above Franz-Josef Land. Among the other characteristic Arctic birds are the eider duck, kittiwakes, skuas, teal, petrels, puffins, and ptarmigans. Further information concerning the mammals and birds of the Arctic region will be found under the names of the animals. See also Distribution of Animals, and the titles of the countries included in the Arctic region.

Arctic Insects. Insects have been collected wherever exploration has extended and vegetation was known. Bees and parasitic hymenopterans occur as far as the Pedicularis or other flowers bloom—up to 82° or more in Grinnell Land, and in Greenland. Beetles are less hardy, and few are known north of the Arctic Circle, but flies, butterflies and moths have been taken up to 83° on the American side of the pole. Thus the Nares expedition brought back several species of Lepidoptera, mostly of common genera (Argynnis, Colias, Lycæna, etc.) of butterflies, while the few moths represent various families. These insects have only about six weeks in which their larvæ can hatch and feed, and probably do not mature in a single season; but it must also be remembered that the whole twenty-four hours of the days of their brief career are sunny, and they fly about continuously.

Marine Life. More than one hundred and twenty-five species of fishes have been taken within the Arctic Circle, and valuable fisheries exist on the northern coasts of Russia, in the waters about Spitzbergen and Nova Zembla, and might be organized north of Bering Strait. The most important are cod, halibut, flatfish, and related forms; but many bottom-feeding families are represented as far north as knowledge extends. Several species of salmon or trout ascend Arctic rivers, the most northerly case being that of *Salmo arcturus*, taken in Grinnell Land (latitude 82°). Food for many of these fishes, and for seals and walruses, is afforded by a large variety of mollusks, including squids, clams, and mussels, and a long list of gastropods, chiefly of the families Pleurotomidæ, Buccinidæ, Natacidæ, and Trochidæ. Nearly one hundred species have been catalogued, a large proportion of which also exist in temperate latitudes. The great abundance of diatoms and the general prevalence of low algæ sustain these and similar low animals. No mollusks are more widespread and numerous, however, than the pteropods, especially of the genera Clione and Limacina, and they furnish an important element in whale diet. There are also chitons and sea-slugs. Crustacea abound in the Arctic seas. A few are of the higher forms, allied to crabs and shrimps, but mainly they are entomostracans of small size and pelagic life. Such amphipods as Anonyx and Hippolyte are well represented in the extreme north at various depths, as also are the copepods, isopods, barnacles, and pycnogonids; and the specimens of such species as are also known southward are very much larger than their southern equivalents. All of these, and especially the copepods, are of great economic importance as food for whales. They are an example of the power of resisting cold possessed by these creatures, for they survive freezing for a long period, and their eggs are still more hardy. The shores and shallows of the Arctic Ocean also abound in annelids, of which twenty or more species have been collected, and which form an important element in the diet of the larger denizens of those seas; and the still humbler ranks of life are represented by jelly fishes and hydroids, especially varied and numerous north of Alaska, and by polyzoans and test-bearing protozoans in great numbers. Seaweeds diminish toward the extreme north to a very few olive-colored kinds, and seem to be more abundant north of Europe than in the American Arctic regions.

Discoveries. For explorers the principal entrance to the Arctic Ocean is the passage between Nova Zembla and Franz-Josef Land; the next most convenient entrance is through Davis Strait. American explorers have generally passed up Davis Strait, Baffin's Bay, and Smith Sound, and through the very narrow Kennedy Channel, but have not as yet succeeded in steaming or sailing by this route into the open Arctic Ocean; although Peary, above Greenland, and Markham, in Grinnell Land, reached the ocean by traveling along the shore.

As to the efforts to reach the North Pole itself, it may be stated that by the use of sledges, Parry, in 1827, reached 82° 45′, far outstripping all previous records; Markham, of the British expedition under Nares, attained 83° 20′; Lockwood, of Greely's expedition, reached 83° 24′; and Peary, in 1900, reached 83° 50′. By the passage eastward toward the New Siberian Islands and the subsequent drift in the ice-floe, Nansen's ship, the *Fram*, in 1895, reached 85° 57′; but having previously left the ship, by a sledge journey over the ice-pack, Nansen and Johannsen reached 86° 14′. On April 26, 1900, Cagni, of Abruzzi's expedition, by a rapid march northward from Franz-Josef Land, reached 86° 33′.

Bibliography. A very good bibliography of the Arctic region is Chavanne, aided by Karpf and Mommier, *Die Litteratur über die Polar-Regionen der Erde* (Vienna, 1878). In this work may be found the titles, classified, of most of the important books that had been written up to the time of its publication. General Greely's *Handbook of Arctic Discoveries* (Boston, 1896) also gives valuable lists of books, classified according to the various spheres of Arctic exploration. A fairly comprehensive work covering *The Natural History, Geology, and Physics of Greenland and Adjacent Regions* (London, 1875), was prepared by T. Jones as a manual for the British Admiralty Expedition of 1875-76. The information presented by the contributors to this work extends somewhat beyond the regions "adjacent" to Greenland, but needs to be supplemented, and in a few passages corrected, by the reports of later explorations. Of such reports, the most important are (1) those of the International Polar Expeditions of 1881-83, published by the various coöperating governments. Those of the United States appeared (a) by Greely under the title, *Report on the Proceedings of the United States Expedition to Lady Franklin Bay* (Washington, 1888); (b) by Ray, under the title, *Report of the Expedition to Point Barrow;* that of Austria, by Wohlgemuth, appeared under the title, *Osterreichische Polarstation Jan Mayen* (Vienna, 1886); that of Denmark, by Paulsen, under the title, *Expedition Danoise, Godthaab* (Copenhagen, 1889-93); that of Great Britain, by Dawson, under the title, *Fort Rae* (London, 1886); that of Russia, by Andreyeff and Lentz, under the title, *Beobachtungen der russischen Polarstationen auf Nowaja Semla* (Saint Petersburg, 1886-95), etc. (2) Wright, *Greenland Ice Fields and Life in the North Atlantic* (New York, 1896), which contains a brief description of the flora and fauna of Greenland and a discussion of Arctic glacial phenomena; (3) Conway, *The First Crossing of Spitzbergen* (London, 1897); (4) Jackson, *A Thousand Days in the Arctic* (New York, 1899), which deals with Franz-Josef Land, and *The Great Frozen Land* (New York, 1895), which deals with the Samoyed peninsula; (5) Peary, *Northward Over the Great Ice* (New York, 1898), which contains a valuable chapter on the most northern Eskimos; (6) Nansen, *Farthest North,* which sets forth the drift of a vessel frozen in the ice across the Arctic Ocean. Books on Arctic currents are: Dittmar, *Das Nord-Polarmeer* (Hanover, 1901), and the report published by the Norwegian Government of the investigations of the ship *Ingolf* in the region of east Greenland and Iceland.

Valuable works on the inhabitants are: Boas, "The Eskimo of Baffin Land and Hudson Bay" (*Bulletin, American Museum of Natural History,* Vol. XV.); Pecher, *The Races of Man and Their Geographical Distribution* (London, 1876); Ratzel, *The History of Mankind* (3 vols., translated; New York, 1896). For the distribution of animals consult Heilprin, *The Geographical and Geological Distribution of Animals* (New York, 1887); for the distribution of plants consult Heer, *Flora Fossila Arctica* (7 vols., Zurich, 1868-80).

For an account of exploration in the Arctic regions, see Polar Research. For further information concerning the magnetic phenomena, see Magnetism, Terrestrial.

ARCTIUM, ärk'shĭ-ŭm. See Burdock.

ARCTOID'EA. See Carnivora.

ARC'TOSTAPH'YLOS (Gk. ἄρκτος, *arktos,* bear + σταφυλή, *staphylē,* grape-bunch). A genus of shrubs and small trees closely related to Arbutus. Most of the species are American; two, however, are circumpolar. The red bearberry (*Arctostaphylos uva-ursi*) is one of them. It is a trailing evergreen shrub, which bears small flowers and red berries. Its associated species, *Arctostaphylos alpina,* has berries which are black when ripe and leaves which are not evergreen. The leaves of *Arctostaphylos uva-ursi* are used in medicine. The manzanita of California is *Arctostaphylos pungens* or *Arctostaphylos manzanita.* It is a shrub or small tree 30 feet high that sometimes forms almost impassable thickets. Only the trailing forms are entirely hardy. Fossil specimens of *Arctostaphylos uva-ursi* have been found in the clays of the glacial period in northern Europe.

ARCTU'RUS (Gk. ἄρκτος, *arktos,* bear, the Great Bear + οὖρος, *ouros,* guardian). The principal star in the constellation Boötes (the 'herdsman'). Arcturus is of the first magnitude, and is very conspicuous in the northern heavens. According to the *Harvard Photometry,* it is exceeded in brightness by only two stars, Sirius and Canopus. Its distance from us is about 1,628,000 times the mean radius of the earth's orbit, so that its light takes about 25½ years to reach us. It may be found by continuing the curve of the three stars which form the handle of the Dipper, or Ursa Major (q.v.).

AR'CUA'TION. See Layering, Arcuation.

ARCUEIL, är'kẽ'y' (anciently, Lat. *Arcus Iulianus*). A suburb of Paris lying four miles south of that city (Map: Paris and vicinity). It is a holiday resort, and noted for the ruins of an aqueduct built by order of the Roman Emperor Julian, and for several aqueducts of modern times. Pop., 1901, 8425.

AR'CUS SENI'LIS (Lat., bow of old age). A change occurring in the cornea of the eye, in consequence of fatty degeneration of its marginal part. The term is objectionable, because the change usually commences before the advent of old age; and further, because the *arcus,* or arch, is usually converted into a complete circle by the time that the patient has reached the age of 60 or 70 years. The *arcus senilis* usually commences at or even before the age of 40 years, as an opaque whitish crescent, skirting either the upper or lower margin of the cornea; and from this beginning it extends along the edge, till it finally becomes a complete circle, which sometimes assumes a chalky whiteness, and gives to the eye a very peculiar appearance. On careful examination, it may be seen that a narrow interval of partially clear cornea always intervenes between the arcus and the opaque sclerotic. As far as the eye is concerned, the formation of this circle is of little importance. It is usually associated with arterio-sclerosis of the blood vessels and fatty degeneration of other portions of the body, including the heart.

ARCY, är'sē', Grotto of. A cavern of remarkable beauty twelve miles east of Auxerre, France. It is supposed to have been used in early times as a stone quarry, and possibly the material for the Auxerre cathedral was taken from it. One of its divisions is 400 yards long, 26 high, and 14 wide.

ARD, or **AIRD**. A Celtic root, meaning 'height' (cf. Lat. *arduus*, high), which appears in many geographical names, especially in Ireland and Scotland.

ARDAHAN, är'dȧ-hän'. The capital of a district in the territory of Kars, Transcaucasian Russia (Map: Russia, F 6). It is situated on the Kur River. Its strategical importance as the point of juncture of the roads to Batum, Akhaltsikh, Kars, and Erzerum was recognized by the Turks, who by constantly improving its fortifications, made it finally a very strong fortress. In 1877, 20,000 Russians under Devel and Heiman successfully stormed it. By the treaty of San Stefano and the Berlin Congress (1878), Ardahan and the surrounding country were ceded to Russia. Pop., 800.

ARDASHIR, är'dȧ-shēr' (Pahlavi *Artaxsatar*, later Pers. *Ardasir*). The name of three monarchs of the Sassanian dynasty of Persia (see SASSANIDÆ), and a later form of the old name Artakhshathra, or Artaxerxes (q.v.). The most important of the three was Ardashir I., or Artakhshatar Papakan, who founded the Sassanian dynasty by overthrowing Artabanus, the last of the Parthian kings, and strengthened his power by further conquests, and ruled over Persia A.D. 226-240. The other two of the name were Ardashir II., 379-383; Ardashir III., 628-629. See PERSIA.

ARDEBIL, är'de-bēl', or **ARDABIL**, är'dȧ-bēl'. A celebrated town of Persia, situated in latitude 38° 15′ north, longitude 48° 19′ east, on a highly elevated plain, forty miles from the Caspian Sea (Map: Persia, C 2). It has a moderate climate, and its picturesque environs and the mineral springs in its vicinity make it the favorite abode of the Persian rulers, whose tombs it contains. Before the Russo-Persian War (1826-28) the city was strongly fortified under the direction of a French general. During the war it was captured by the Russians, and was subsequently nearly ruined by earthquakes. It derives some importance from its proximity to the Lenkoran-Tabriz caravan route. Its population is estimated at 15,000.

ARDÈCHE. är'dĕsh'. A department in the south of France. It takes its name from the river Ardèche, a tributary of the Rhône, and includes the northernmost part of the ancient province of Languedoc. Area, 2145 square miles; population, 1896, 360,599; 1901, 353,564. Ardèche is almost wholly mountainous. The upland, which has winter for about six months, is devoted to pasturage; the terraces and valleys near the Rhône have a warm climate and produce good white and red wine, olives, dates, almonds, chestnuts, etc. Lead, iron, copper, and manganese are mined. Capital, Privas.

AR'DEN, EDWIN HUNTER PENDLETON (1864—). An American actor and manager. He was born February 13, 1864, in St. Louis, Mo. He left home at the age of 17, and after a variety of experiences in the West went upon the stage in 1882, with J. W. Keene's company, in Chicago. Besides his engagements with other managers, he has traveled for a number of years with his own company, and appeared in plays of his own authorship. He has written, either alone or in collaboration, *Eagle's Nest*, *Barred Out*, *Raglan's Way*, and *Zorah*.

ARDEN, FOREST OF. A wood in Warwickshire, in old times very extensive. It is supposed to have been a hunting-ground of Robin Hood's. Certain authorities believe that Shakespeare used it as a background in *As You Like it;* others assert that his scenery was taken from the forest of Ardennes.

ARDENNES, är'dĕn' (Celt., high wooded valley, from *ard;* Lat. *arduus*, high; the ancient Lat. *Arduenna Silva*, Ardenne Forest). A wild, hilly region, extending over portions of Belgium and France, and gradually sloping toward the plains of Flanders. In early times, the name was given to a vast forest lying between the Rhine and the Sambre, a distance of about 160 miles. The average height of the hills is less than 1600 feet; but in the east, Mont St.-Hubert attains an elevation of 2100 feet. Large tracts of this region consist of gently undulating plateaus densely covered with oak and beech forests, while other portions are marshy, heathy, and barren. The districts through which the Meuse and other rivers flow present some extraordinary appearances. The channel of the river is sometimes bound in by rugged and precipitous cliffs more than 600 feet high. The principal rocks of the Ardennes are clay slate, graywacke, quartz, etc., interspersed with extensive strata of Paleozoic limestone. There are coal and iron mines in the northwest; lead, antimony, and manganese are also found. There is little cultivation of grain, but cattle and sheep are extensively reared. Consult A. Meyrac, *Villes et villages des Ardennes* (Charleville, 1898).

ARDENNES. A frontier department in the northeast of France. It forms a part of the old province of Champagne. Area, 2028 square miles; population, in 1896, 318,865; in 1901, 315,589. The northeastern part of Ardennes belongs to the basin of the Meuse; the southwest is watered by the Aisne; and both of these rivers, united by the Canal of Ardennes, receive several affluents. About one-eighth of the surface is hilly and covered with forests and wide tracts of pasturage. The valleys alone are fertile and produce corn. The vine is cultivated at Mézières, in the southwest. In the north, near Givet, marble is obtained; but the prevailing rock is limestone, veined with lead and iron. Slate, marble and iron, porcelain clay, and sand for making glass are obtained. Capital, Mézières. Consult A. Joanne, *Le département des Ardennes* (Paris, 1898).

ARDENNES, THE WILD BOAR OF. An appellation of William de la Marck, a lawless baron of the reign of Louis XI., whom Scott has introduced in several chapters of *Quentin Durward*.

AR'DEN OF FEV'ERSHAM. The first English "*bourgeois* tragedy." It deals with a murder by a wife and her paramour. The plot was drawn from an actual occurrence, contemporary with it. It was first printed in 1592; its authorship is unknown. The play has been attributed both to Shakespeare and to Kyd. In 1736, Lillo, author of *George Barnwell*, began an adaptation of it, which was completed after his death by Dr. Hoadley and produced in 1790. For further information, consult: Saintsbury, *History of Elizabethan Literature* (London, 1887).

ARDITI, är-dē′tē, LUIGI (1822-1903). An Italian composer and musical conductor. He was born at Crescentino, Piedmont, July 16, 1822. After graduating from the Milan Conservatory in 1842, he began his career as a violin virtuoso, traveling with Bottesini, the famous double-bass player. With the Havana Opera Company, of which he became conductor, he visited New York in 1847 and during subsequent seasons, conducting in 1854 the first performance at the Academy of Music, where he brought out his opera, *La Spia* (based on Cooper's novel, *The Spy*), with Brignoli and La Grange. In 1857 he was conductor at Her Majesty's Theatre in London. In 1869 he conducted *The Flying Dutchman*, the first performance of a Wagner opera in England. In 1878, and many subsequent seasons, he again conducted opera in New York. His waltz songs, *Il Bacio* (to which Piccolomini gave great vogue) and *Fior di Margharita* (sung by Patti and other great prima donnas), are famous. He was Patti's favorite conductor. His other operas are *I Briganti* (1841) and *Il Corsaro* (1856). He published *My Reminiscences* (New York, 1896), containing a good deal of valuable information, besides interesting chitchat.

ARD′MORE. A city in the Chickasaw Nation, Indian Territory, about 500 miles south by west of Kansas City, Mo.; on the Gulf, Colorado, and Santa Fe and other railroads (Map: Indian Territory, F 4). It is the seat of Hargrove College, controls large commercial interests in cotton, coal, and asphalt, and is an important stock-raising centre. Ardmore was settled in 1886 and incorporated in 1898 under a charter providing for a mayor, elected every two years, and a council. Population 1900, 5681; 1906 (local census), 14,000.

ARDOCH, är′dŏȯ. A small village in Perthshire, Scotland, eight miles south-southwest of Crieff, with the best-preserved Roman camp in Britain (Map: Scotland, E 3). The camp is 2½ miles north of Greenloaning station on the Caledonian Railway, in the grounds of Ardoch House. The intrenched works form a rectangle 500 by 430 feet, the four sides facing the cardinal points. The north and east sides are protected by five ditches and six ramparts, these works being 270 feet broad on the north side and 180 feet on the east. A deep morass exists on the southeast, and the perpendicular banks of Knaig Water, rising 50 feet high, protect the camp on the west. The prætorium, or general's quarter, now called Chapel Hill, rises above the level of the camp, but is not exactly in the centre, and is nearly a square of 60 feet each side. Three of the four gates usual in Roman camps are still seen. A subterranean passage is said to have formerly extended from the prætorium under the bed of the Knaig. Not far north of this station, on the way to Crieff, may be traced three temporary Roman camps of different sizes. Portions of the ramparts of these camps still exist.

ARDROS′SAN (Gael. *ard*, high + *rossan*, point). A small seaport town and summer resort in Ayrshire, Scotland, on the Firth of Clyde, about 30 miles southwest of Glasgow (Map: Scotland, D 4). Its harbor, sheltered by an island off the coast, is one of the safest and most accessible on the west coast of Scotland, and has been greatly improved by the earls of Eglinton. There is a large export of coal and pig iron from this place, and ship-building is carried on to a considerable extent. On a hill above the town stand the ruins of Ardrossan Castle, said to have been surprised by Wallace when held by the forces of Edward I. Population of the police burgh in 1901, 5933.

ARE, är (Lat. *area*, piece of level ground). The unit of the French land measure; a square, the side of which is 10 metres (or 32.809 feet) long, and which, therefore, contains 100 square metres = 1076 English square feet. The next denomination in the ascending scale is the *decare*, containing 10 ares; but the denomination commonly used in describing a quantity of land is the *hectare* of 100 ares = 2.47 English statute or imperial acres. See METRIC SYSTEM.

A′REA (Lat., piece of level ground, vacant place). The superfices of any bounded surface or space. The calculation of areas, or mensuration of surfaces, is one of the ultimate objects of geometry. Area is commonly measured by a square unit, as the square inch, square yard, square metre, square degree. (See MENSURATION; and QUADRATURE.) In antiquity this word meant any space free of buildings, such as a square, inclosure, court, arena of a circus, space around a temple or any other public building. In this connection, the area was consecrated ground. So, in connection with early Christian churches there were areas protected by law, in which the faithful were buried. The modern use of the word is restricted to the open space of a narrow front yard or back court, or in connection with a basement.

ARE′CA (Sp. Portug., from Canarese *adiki*). A genus of palms containing about twenty species, having pinnate leaves and three or more spathes. The fruit is a fibrous one-seeded drupe, a nut with an outer fibrous husk. *Areca catechu*, the Pinang palm, or betel-nut palm, is a native of the East Indies, whose nut yields a sort of catechu. (See CATECHU.) This areca-nut, or betel-nut, is very much used in all parts of the East, the chewing of it with quick-lime and the leaf of the betel-pepper being one of the most prevalent habits of the people. (See BETEL.) The fruit is about the size of a hen's egg, smooth, orange or scarlet, the fibrous husk about half an inch thick. When chewed it reduces the saliva and stains the lips and teeth. It is said to stimulate the digestive organs and to prevent dysentery. Areca-nuts form a considerable article of trade in the East. The timber of the palm which produces them, and its leaf-stalks and spathes, are also used for domestic purposes. The tree is often 40 to 100 feet high, and in general less than a foot in diameter. The leaves are few, but very large, their leaflets one to two feet long. In Malabar, an inebriating lozenge is prepared from the sap. *Areca oleracea*, or *Oreodoxa oleracea*, the 'cabbage palm' of the West Indies, is a very tall tree, 100 to 200 feet, whose huge terminal leaf-bud is sweet and nutritious, and is sometimes used for the table as cabbage; but when it is cut off the tree is destroyed. The stem of this tree, notwithstanding its great height, is remarkably slender. The nuts are produced in great numbers; they are about the size of a filbert, and have a sweet kernel. *Areca sapida*, now called *Rhopalostylis sapida*, the New Zealand palm, is remarkable as extending southward beyond the geographical limits of any other of its order, as far, indeed, as latitude 38° 22′ S. It is a small palm, only from six to ten feet high, with leaves four to six feet long. The young inflorescence is eaten. *Areca vestiaria*, a native of the East, is so called because clothing is made from its fibres. For illustrations, see Palms.

ARECIBO, ä′rȧ-sē′bō. The chief city of the department of the same name, rather picturesquely situated on the northern coast of Porto Rico (Map: Porto Rico, B 2). It is about forty miles west of San Juan, with which it is connected by rail, and has a rather shallow harbor and some sugar mills. Population, in 1899, 8008.

AR′EIOP′AGUS. See Areopagus.

ARE′NA (Lat., sand, sandy place, beach, coast). The central part of an amphitheatre, inclosed by the seats. In it the gladiatorial contests and other games were held, and the name *arena* was given to it because of the sand which was spread to soak up the blood. The term is extended to mean any flat inclosure for the exhibitions of shows, games, sports, and contests, and even figuratively to political and other intellectual contests. See Amphitheatre.

AR′ENA′CEOUS ROCKS (from Lat. *arena*, sand), or Psammites, Gravel and Sand Rocks, composed mainly of quartz particles deposited through water or air. They are mechanical sediments produced by the disintegration and removal of silicious rocks by the action of atmosphere, rain, rivers, frost, lake and ocean waves, and other superficial agencies. The arenaceous rocks or psammites, include plain sand, river sand, sea sand, sandstone, graywackes, quartzite, gravel, shingle, and conglomerate (q.v.). Seldom are they composed entirely of quartz; the quartz being commonly associated with fragments of other minerals such as feldspar, mica, iron ore, hornblende, etc., all of which may be cemented by carbonate of lime or magnesia, quartz, or iron. See Argillaceous Rocks; Calcareous Rocks; Rocks. Arenaceous rocks grade by intermediate stages into argillaceous rocks through increasing admixtures of clay, and into calcareous rocks by admixture of lime.

ARENALES, ä′rȧ-nä′lĕs, Juan Antonio Alvarez de (1755-1825). An officer in the patriot army in the Peruvian revolution against Spain. In 1820, with a body of a thousand men, he was sent from Pisco with orders to strike into the country across the Andes and proceed by a circuitous route to Lima, there to meet the main army—a feat not unlike Sherman's famous march, which he accomplished most successfully, completely defeating the Spanish army at Cerro-Pasto.

AR′ENA′RIA (Lat. *arenarius*, pertaining to sand, from *arena*, sand), or Sandwort. A large genus of plants of the natural order *Caryophyllaceæ*, differing from *Stellaria* (Stitchwort, *q.v.*) chiefly in the undivided petals. The species, about two hundred in number, are annual and perennial herbaceous plants of humble growth, rarely somewhat shrubby, and natives of the temperate and colder parts of the world. Some of them are arctic and alpine plants. Many of them are chiefly found in sandy soils. The flowers are generally small and inconspicuous, but if closely examined, are seen to possess no little beauty.

ARENBERG, ä′ren-bĕrk, or **AREMBERG**, ä′rĕm-bĕrk, August Maria Raimund, Prince (1753-1833). A Belgian soldier and author—also known as Count Lamarck—a brother of the Duke of Arenberg. He served in India in 1780, and participated in the Belgian revolt of 1789, but afterwards swore allegiance to the Emperor Leopold II. He was an intimate friend of Mirabeau during the French Revolution, and his *Correspondance entre le Comte de Mirabeau et le Comte de Lamarck* (edited by Vacourt, two volumes, Brussels, 1851) must be considered a valuable contribution to the history of the French Revolution.

ARENBERG, Leopold Philipp Karl Joseph, Duke of (1690-1754). An Austrian field-marshal. He was born at Mons, of one of the most illustrious families of Belgium. At sixteen he was colonel of a regiment, and councillor of state to Archduke Charles, the Austrian claimant to the Spanish throne, who subsequently became Emperor as Charles VI. He fought at Malplaquet in 1709 and in the same year became grand bailiff of Hainault. In 1716 he served in Hungary under Prince Eugene, and fought at Belgrade in the following year; on returning to the Netherlands in 1718 he was made military governor of Hainault, and subsequently commander-in-chief of all the Austrian forces in the Netherlands, with the rank of field-marshal. In 1743 he led his troops with great gallantry at Dettingen. Afterwards he served in Silesia under Charles of Lorraine, and in 1747 was president of the commission in control of the Netherlands. He was a lover of the sciences and of letters, and was a patron of J. J. Rousseau. He also corresponded with Voltaire and with Frederick the Great. The fullest account of Leopold of Arenberg is that given by Gachard, in the *Biographie Nationale*, published by the Royal Academy of Belgium, and founded on documents in the Belgian royal archives.

ARENDAL, ä′ren-dȧl. A town on the southeast coast of Norway, situated near the mouth of the Nid Elf in the Bay of Christiania, forty miles northeast of the city of Christiansand (Map: Norway, C 7.). It is built partly on piles, partly on rock, with numerous canals intersecting it, and this circumstance, as well as its situation, gives it a very romantic aspect, and has caused it to be called "The Little Venice." The bay, which is protected by the island of Tromö, forms an excellent harbor, and favors the commerce of the town. The exports are iron from the neighboring mines, and wooden articles. Ship-building is also carried on, and on a smaller scale, distilleries and tobacco factories. Population, in 1900, 4370.

ARENDT, ä′rĕnt, Otto (1854—). A German economist and politician, born in Berlin. He studied law and political science at Leipzig and Freiburg, and with the appearance in 1880 of his work, *Die vertragsmässige Doppelwährung*, became an active advocate of bimetallism. He was one of the founders of the society for the introduction of international bimetallism (1882), and became the real head of the party in Germany. In 1885 he was elected to the Prussian House of Representatives as a member of the

Liberal Conservative party. In 1888 he began to edit the *Deutsches Wochenblatt*, and to advocate colonial expansion and the coalition of national parties. His published works include *Leitfaden der Währungsfrage* (17th ed., 1895).

ARENDT, ä′rent, Rudolf (1828—). A German chemist, born at Frankfurt-on-the-Oder. He studied at the University of Leipzig, and after 1861 taught at the commercial high school there. He wrote text-books of chemistry, and valuable manuals for teaching chemistry. The best known among his works is his *Technik der Experimental Chemie* (two volumes, ed. 1, Leipzig, 1881; ed. 2, 1891). Arendt was also for many years editor of the *Chemisches Centralblatt*.

ARÈNE, à′rĕn′, Paul Auguste (1843-96). A French writer, born at Sisteron. He was director of the Lyceum at Marseilles, and afterwards of that at Vanves, and gained his first success as an author with his *Pierrot héritier* (presented in 1865), a one-act comedy in verse. His further publications include the dramatic works *Jean des figues* (1870), *Les comédiens errants* (1873), and *Le duel aux lanternes* (1875), some prose fiction, such as *Au bon soleil* (1879), and *Le canot des six capitaines* (1888), and a volume of descriptions of travel, *Vingt jours en Tunisie* (1884). His work was marked by delicate humor. He was a regular contributor to *La République Française, L'Evénement*, and *Gil Blas*.

ARENG′ PALM. See Gomuti.

ARENSKI, Anton Stephanowitch (1861-1906). Leading Russian composer; taught at the Moscow Conservatory, and was afterward conductor of the court chapel in St. Petersburg. Operas: *The Dream on the Volga* (1892); *Raphael* (1894); *Nala and Damayanti* (1899); for orchestra: 2 *Symphonies* (Bm and A); *Concerto for piano;* do, *for violin; Fantasie for piano and orchestra.* Chamber music: *String quartets, trios, piano quintet.* Many compositions for piano, songs, and choruses. Theoretical works: *Treatise on Harmony* and *Handbook of Musical Form.*

ARENTS, ä′rents, Albert (1840—). A German-American metallurgist. He was born at Klausthal, Germany, and studied mining engineering there, and at Berlin. In 1865 he came to the United States and undertook to treat the lead ores in Hampden County, Mass. He was metallurgist and mining engineer of a number of enterprises in the Western States, and patented many valuable industrial improvements.

ARENTZEN, ä′rents-en, Kristian August Emil (1823-1900). A Danish poet. He was born at Copenhagen, and after extensive travels he was appointed to the chair of æsthetics in the University of Copenhagen. He published two dramas, *Gunlög Ormetunge* (1852), and *Knud den Hellige* (1853), and a volume of *Digte* (1854, republished as *Ny Digtsamling*, 1867). He is chiefly known for his important critical work, *Baggesen og Oehlenschläger* (8 vols., 1870-78).

AREOIS, à′rwä′. The society of the Areois was a famous institution among the natives of the Society Islands (Tahiti), organized for literary, dramatic, and especially religious purposes. The members traveled from place to place, singing, dancing, and representing historical events and scenes in the lives of gods and heroes. They also devoted themselves to erotic pleasures (love adventures and sexual congress of an absolute reality were acted), which has made the *Areois* stand for a sort of artistic sexualism. Upon the women belonging to the society, infanticide was imposed by oath. It represents one of the most remarkable sides of Polynesian life, for which a parallel has to be sought in the European Middle Ages.

A′REOM′ETER. See Hydrometer.

AR′EOPAGIT′ICA. A pamphlet advocating unlicensed printing; the greatest prose work of Milton (1644), a plea for freedom of thought.

AR′EOP′AGUS (Gk. Ἄρειος πάγος, *Areios pagos*, the hill of Ares). A bare, rocky hill at the west of the Acropolis of Athens, about 350 feet high. The ancients explained the name by saying that here Ares had been tried for the murder of Halirrhothius, or that the Amazons, the worshipers of Ares, had attacked the Acropolis from this point. Some modern writers prefer to connect it with the Eumenides, and the blood-guiltiness, which was tried here, and derive the name from Ἀραί, so that the meaning would be "hill of the curse." At the south end steps hewn in the rock lead to a series of rock-cuttings which cannot now be satisfactorily explained. On the north side, which overlooks the city, and is near the deep cleft where the Eumenides were worshiped, seems to have been the place where the court of Areopagus tried cases of willful murder. The Areopagus gave its name to the most venerable court of Athens (Gk. ἡ ἐν Ἀρείῳ πάγῳ βουλή, the Council on the Areopagus). It met in the open air, and accuser and accused stood on platforms hewn from the rock. The Areopagus seems originally to have been the council of nobles, such as surrounds the king in the Homeric poems, and naturally, therefore, the 'king' archon remained its presiding officer. This council appears to have gradually taken into its hands the entire governing power, since we are told that it appointed all officials, including the archons, who entered the Areopagus at the end of their term of office. This prevailed through the historical period, in spite of its undemocratic character. The Areopagus exercised the supreme judicial power, and could bring to an account any official, so that its indirect influence must have sufficed to control the State. In the code of Draco, the Areopagus kept its place as the court for all cases of willful murder, and even under the Solonian Constitution it seems to have preserved its place as a guardian of the laws, with the power of procedure against any official, or even private citizen, whose conduct was an offense against good morals or the well-being of the community. Clisthenes seems to have made no change in the rights of the Areopagus; but his creation of the Senate of Five Hundred and the power given the popular assembly certainly must have lessened its real influence. It is certain that in B.C. 462 the leaders of the democracy, Ephialtes and Pericles, succeeded in carrying a law which deprived the Areopagus of all those powers by which it exercised a general control over officials and public morals, leaving it only the right of judgment in murder cases, and the oversight of the sacred olive trees of Athena and some sacred lands. In spite of this reduction of its powers, it remained the most venerated body in Athens, and we find it appointed at times to act for the State, or to conduct investigations of treasonable conduct, as a sort of commission of the popular assembly. In the reforms of Demetrius of Phalerum (B.C. 317), the Areopagus seems to have been given once more an oversight over public morals, and especially over offenses against the new sumptuary laws. In Roman times it was one of the governing bodies of Athens, and its name appears on decrees with that of the senate and people. Its jurisdiction was also widely extended, and its decisions still commanded great respect. It is doubtful whether the Apostle Paul was actually brought before the court of Areopagus. It seems more probable that his speech was delivered before a body of curious philosophers on the hill of Areopagus, a convenient spot somewhat retired from the confusion of the neighboring market-place. In Athenian legend the court was famed as the body which, under the presidency of Athena, acquitted Orestes of the charge, brought against him by the Furies, of blood-guiltiness in murdering his mother, Clytemnestra. The story forms the subject of the *Eumenides* of Æschylus. Consult: Philippi, *Areopag und Epheten* (Berlin, 1874); Busolt, *Handbuch* (Nördlingen, 1887); Schömann, *Griechische Alterthümer*, ed. Lipsius (Berlin, 1897); Meier and Schömann, *Der attische Prozess*, ed. Lipsius (Berlin, 1883-87); and Botsford, *The Athenian Constitution* (New York, 1893).

AREQUIPA, ä'rȧ-kē'pȧ. A maritime department of Peru, bounded by the departments of Ayacucho and Cuzco on the north, Puno on the east, Moquegua on the south, and the Pacific on the west (Map: Peru, C 7). Area, 21,951 square miles. It is mountainous in the east and has a fertile soil, but is sparsely settled. The population was officially estimated in 1896 at 229,007. Capital, Arequipa (q.v.).

AREQUIPA. An episcopal city, capital of the department of Arequipa, Peru; situated on the Chile River, 105 miles northeast of the port of Mollendo, with which it is connected by railroad. Another line runs to Puno, on Lake Titicaca, 225 miles to the east. Its situation, on a plateau 7000 feet above sea level, at the foot of the half-extinct volcano Mistí, gives it a very dry and temperate climate. The air is exceedingly dry and the water is impregnated with salts. It is the second city in Peru, is regularly laid out, and has a cathedral, a university, and two national schools. The inhabitants are engaged in the manufacture of jewelry, the cutting of precious stones, and in commerce, the city being the centre of trade for the interior of Peru. Nearby is the Arequipa Observatory, a branch of the Harvard College Observatory, at an altitude of 8060 feet. It contains the Bruce Photographic Telescope, the largest instrument of the kind yet constructed, the gift of Miss Catherine W. Bruce of New York. Arequipa was founded in 1540 by Francisco Pizarro, and has ever since been important in the history of Peru, occupying a prominent place in the war for independence. From the 13th to the 15th of August, 1868, the city was subjected to earthquake shocks which overthrew nearly all its buildings and killed more than 600 people. Population, in 1889, 30,000; in 1896, 35,000.

AREQUIPA, or Mistí. A volcanic mountain of the Andes, Peru, over 20,000 feet high. The volcano has been in a dormant state since 1831.

A'RES, ā'rēz. See Mars.

AR'ETÆ'US (Gk. 'Αρεταῖος, *Aretaios*). A famous Greek physician and writer of Cappadocia, who flourished in the latter half of the First and in the beginning of the Second Century after Christ. He is considered to rank next to Hippocrates in the skill with which he treated diseases. He was noted for his total want of professional bigotry; and in his accuracy in the detail of symptoms and the diagnosis of disease he is superior to most of the ancient physicians. His great work, written in singularly elegant and concise Ionic Greek, is divided into two parts. The first four books treat of the causes and symptoms of acute and chronic diseases; the last four, the cure of the same. They have been translated into various European languages, besides having been frequently edited in the original. The finest edition is the Oxford one of 1723, by J. Wigan. A German translation appeared at Vienna (1790-1802); an English one, by T. F. Reynolds, London, 1837; and there is a Greek and English edition by Dr. F. Adams (London, 1856).

AR'ETHU'SA. See Alpheus.

ARETHUSA BULBO'SA. A beautiful terrestrial orchid growing in wet bogs of the northern United States. The plant is small, and consists of a slender scape, six to ten inches in height, which arises from a corm. The lower portion of the scape bears a few green bracts, and the summit is crowned by a brilliant rose-pink flower one to two inches in length. The plant blooms in late spring, and is often found associated with the pitcher-plant (Sarracenia) and two other orchids—Calopogon and Pogonia —which plants, however, bloom at a later period than does Arethusa. For illustration, see plate of Anemone.

AR'ETIN'IAN SYL'LABLES. The syllables *ut, re, mi, fa, sol, la,* used by Guido d'Arezzo (q.v.) for his system of hexachords, to which *si* was added afterwards, thus completing the modern scale.

ARETINO, ä'rȧ-tē'nō. Carlo (properly Carlo Marsuppini) (c.1399-1453). An Italian humanist. He was born at Arezzo (whence his surname), studied the Latin language and literature at Florence under Giovanni da Ravenna and Greek under Manuel Chrysoloras; and, with the patronage of the Medici, lectured learnedly and successfully on the classics. His first lecture, indeed, seems at once to have established his fame; for on that occasion, we are told, he amazed all by quotations from every known author, Greek or Roman. But it also seems to have begun the quarrel between him and the renowned Filelfo, who eventually, through Medicean hostility, was compelled to withdraw to Siena. He was appointed first apostolic secretary, and became in 1444 chancellor of the Republic of Florence. His writings include translations into Latin of the *Batrachomyomachia* and Book I. of the *Iliad.* His finely sculptured tomb is still to be seen at Florence, in the Church of Santa Croce.

ARETINO, Guido. See Guido d'Arezzo.

ARETINO, Leonardo. See Bruni.

ARETINO, Pietro (1492-1556). A notorious and profligate Italian author of the Sixteenth Century, who, apart from his comedies, is interesting chiefly for his colossal and successful impudence. He was born at Arezzo, the son of a shoemaker, Luca, whose surname is unknown; for Pietro, being ashamed of his origin, assumed that of Aretino. While still young he came to Rome and found favor with Pope Leo X. and Cardinal Giulio de Medici, but lost it through writing some licentious sonnets. For a while he frequented the Medicean court, where he attached himself closely to Giovanni de Medici, but in a few years withdrew to Venice, where he soon acquired powerful friends, and where he remained almost continually till his death. Aretino has best been summed up as a systematic blackmailer. His letters are an astonishing record of audacity; they show him to have been equally adept in the art of threats and of successful flattery, and extorted from many of the greatest figures of the time—even from Francis I. and Charles V.—rich gifts of jewelry, large sums of money, and in some cases even annuities, which enabled him to lead at Venice a life of lavish opulence. He was a remarkably prolific writer in various fields of literature, and has left dialogues, biographies, sonnets and other poems, comedies, one tragedy, and six volumes of letters. Aside from the tragedy *Orazia*, which was good, judged by contemporary standards, the comedies, of which the principal ones are the *Cortigiana* and *Talanta*, are alone of any merit, and their interest is due mainly to their vivid portrayal of life; but, in the words of Symonds, it is life seen "from the standpoint of the servants' hall." Aretino's greatest strength lay in his satire. There is an edition of *Le commedie e L'Orazia tragedia di Pietro Aretino* (Milan, 1876). Consult: Graf, *Attraverso il Cinquecento* (Turin, 1888); Van Dyke, *Renascence Portraits* (New York, 1905).

ARETINO, Spinello. See Spinello.

AREZZO, ȧ-rĕt'sô (ancient Lat. *Arretium*). An episcopal city of Italy, the capital of the province of Arezzo, Tuscany (Map: Italy, F 4). It is beautifully situated on the slope of a hill, 54 miles southeast of Florence and 6 miles from the confluence of the Chiana and the Arno. It has broad streets, impressive buildings, a famous academy of science, a museum and picture gallery, a library, many convents, and excellent mineral springs. Externally, the cathedral, which was begun in the Thirteenth Century, is unattractive; but the proportions of the interior are pleasing and the decorations are elaborate and by master hands of several centuries. The church of San Francisco contains some fine Fifteenth Century frescoes. The Pieve, begun in the Eleventh Century on the site of a heathen temple, also contains art treasures. Arezzo was one of the twelve richest and most populous cities in ancient Etruria, and excelled in pottery and in copper work. In the Social War, Sulla sacked it, banished its citizens, and replaced them with his own followers. It was also sacked by the Goths under Totila and restored under Justinian. During the contest of the Guelphs and Ghibellines in a later age, it became subject to Florence, being defeated in the battle of Campaldino, in which Dante took part. Among celebrated men born here were Mæcenas, the famous patron of letters in the time of the Emperor Augustus; Petrarch; Carlo Aretinus; Pietro Aretino; Guido Aretino; Leonardo Aretino, the historian; Cesalpino, the botanist; Redi, the physician; Pope Julius II.; the notorious Marshal d'Ancre; and Vasari, author of *Lives of the Painters*. The principal manufactures are cloth, silk fabrics, and leather. The country is unusually fertile, and produces grain, wine, oil and fruit. Population, in 1881, 39,000; in 1901 (commune), 44,316.

ARGÆ'US, ăr-jē'ŭs, Mount. See Arjish.

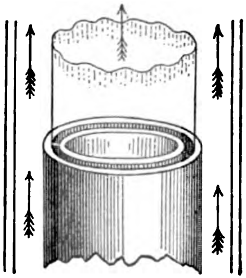
AR'GALI (Mongolian name). A mountain sheep, specifically *Ovis ammon*, formerly common to all the mountain ranges of northeastern Asia, but lately killed off in Siberia and restricted to the heights of Mongolia, where it is found near timber line. Its size is that of a large donkey, and it is covered by short, coarse, gray-brown hair, with the short mane and a stripe down the forelegs dark and the rump and under surface of the body white. The massive horns of the ram coil like those of the bighorn (sometimes called American argali), and measure 40 to 48 inches along the curve and 16 or more around the base; the horns of the ewes reach about half these dimensions. A closely allied species is the nyan, or Thibetan argali (*Ovis Hodgsoni*), which is distinguished by a white ruff upon the throat. It frequents the barren and desolate regions of high Thibet. Sportsmen regard these sheep as among the most difficult game to stalk, and good specimens are rare in collections. See Bighorn; and Plate accompanying Sheep.

AR'GALL, Sir Samuel (c.1580-1626). An English navigator, and deputy governor of the Virginia colony, born about 1580 or 1585. In 1609 he was sent to Virginia in charge of a vessel, with orders to find a more direct route than that previously followed, and he succeeded in considerably shortening the time ordinarily occupied by the passage. After his arrival, in 1609, he was employed in surveying Chesapeake Bay and a large part of the coast northward to Cape Cod. Returning to Virginia, he took part in the fighting with the Indians, and in 1612 he conducted the negotiations with the chief of a Potomac tribe to whose care the women of the Powhatan tribe had been intrusted during hostilities, by which the English secured possession of Pocahontas, a favorite daughter of the chief, Powhatan, in exchange for a copper kettle. Her marriage to John Rolfe followed soon after, and the troubles with the natives were settled, leaving Argall free to go to sea again. In 1613 he was given command of a powerful war vessel, and instructed to keep all intruders out of the territory claimed for England. He sailed to Mount Desert Island, where he found a French Jesuit settlement, which he destroyed, carrying off the settlers to Jamestown as prisoners. French establishments at Port Royal and Saint Croix received the same treatment. At New Amsterdam (now New York) Argall found a Dutch colony, and forced the governor to haul down his flag and display the English colors in its place—a recognition of English supremacy which lasted so long as Argall was in the harbor. In 1617 Argall was promoted to be deputy governor and admiral of Virginia. He conducted affairs in a high-handed fashion, and was accused of engaging in illegal trade, especially with the Spanish settlements in the West Indies. He ignored several peremptory orders to return to England to answer the charges against him, but eventually went back to stand trial. No serious action, however, was taken, probably because of the protection afforded him by the Earl of Warwick, who is supposed to have participated in the profits of Argall's ventures. In 1620 Argall was captain in a fleet which attacked the Algerine pirates in the Mediterranean. A year later he was knighted. In 1625 he was appointed admiral of an Anglo-Dutch fleet of twenty-eight vessels, which took Spanish prizes valued at over £100,000, and later in the same year took part, as commander of the flagship, in Cecil's expedition against the Spaniards..

AR'GAN (Ar. *arjan*), ***Argania sideroxylon.*** The common species of the order Sapotaceæ. It is a low, spiny evergreen tree, native of the southern parts of Morocco, and it bears an ovate drupe the size of a plum, dotted with white, and full of a white milky juice. The Moors extract from the fruit an oil known as "argan oil," which they use with their food.

ARGAN, är'gäɴ'. The hypochondriac in Molière's *Le malade imaginaire*, who allows himself to be cozened by apothecaries even to the extent of forcing his daughter to receive the addresses of one. He is finally effectively disillusioned and cured by his brother-in-law.

ARGAND, är'gand, *Fr. pron.* är'gäɴ', Aimé (1755-1803). The inventor of the well-known Argand burner. The chief difficulty that attended the use of lamps as a source of light before Argand introduced his invention, consisted in procuring complete combustion of the oil, so as to keep the flame from smoking. The round thick column of oil-vapor rising from the wick of an old-fashioned lamp presented an insufficient extent of surface to the air: a large proportion of the carbon of the oil, therefore, not reached by the air, remained unburnt and ascended in the form of smoke. Argand's improvement consisted in making the wick ring-shaped. The flame procured by means of a circular wick has naturally the form of a hollow cylinder, with a current of air ascending through the inside, so that the burning surface is doubled. Even when supplied with this form of burner, however, the lamp remained unsatisfactory until Argand's younger brother accidentally discovered the effect of the glass chimney, by which the flame is steadied, a draught created, and thus the greatest possible amount of light produced. The Argand burner is now extensively used in gas-lighting.



ARGANTE, är'gäɴt'. (1) A witty portrait in Molière's gallery of dupes—the father who, in *Les fourberies de Scapin*, is trickily persuaded by Scapin to give up his own plans in favor of those of his son and daughter. (2) A giantess typifying Licentiousness in the *Faerie Queene*, by Spenser.

ARGANTES, är-găn'tēz. A fierce Circassian, the bravest of the infidel warriors, in Tasso's "Jerusalem Delivered."

ARGAO, är-gä'ō. A town of Cebu, Philippines, situated about 33 miles southwest of Cebu. Population, 1903, 35,448.

ARGEL, är'gĕl, or **ARGHEL** (Syrian), *Solenostemma argel.* A plant of the natural order *Asclepiadaceæ*, a native of Arabia and of the north of Africa, deserving of notice because of the frequent use of its leaves for the adulteration of senna. They are lanceolate and leathery, and may readily be distinguished from genuine senna leaves by their texture, their being downy, their greater heaviness, the comparative absence of veins, and the symmetry of their sides, the sides of the true senna leaves being unequal. They are acrid, and cause sickness and griping; but a difference of opinion prevails as to their possessing purgative properties.

ARGELANDER, är'ge-län'dēr, Friedrich Wilhelm August (1799-1875). One of the most eminent German astronomers of the Nineteenth Century. He was born at Memel, Prussia. He studied at Königsberg, where the political sciences first attracted him; but he was subsequently drawn away to astronomy by the lectures of Bessel, by whom he was employed to make calculations and observations. In 1820 he was appointed assistant to Bessel in the Königsberg Observatory, and in 1823 succeeded Walbeck as astronomer at the observatory of Åbo, in Finland. Here he began a series of observations on the fixed stars which have a perceptible "proper motion." His studies were unfortunately interrupted by a fire which destroyed the observatory; but after a time he resumed them in a new observatory at Helsingfors, and published a catalogue of not less than 560 stars having "proper motions." This contained the results of his observations at Åbo, and received from the Academy of Saint Petersburg the Demidoff Prize. In 1837 he was invited to fill the chair of astronomy at the University of Bonn. Argelander was long engaged in a series of observations on the changes of light in variable stars, and he also added to our ideas concerning the progressive motion of the solar system in space. Argelander's works include: *Observationes Astronomicæ in Speculæ Universitatis Fennico Factæ* (3 vols., Helsingfors, 1830-32); *Neue Uranometrie* (Berlin, 1843), containing eighteen celestial charts of fixed stars seen with the naked eye; *Mittlere Oerter von 33,811 Sternen* (Bonn, 1867); and a few others of considerable importance. His greatest work, however, is the *Atlas des nördlichen gestirnten Himmels* (Bonn, 1857), with a *Sternverzeichnis* (Bonn, 1859-62, Vols. III.-V of the *Astronomische Beobachtungen auf der Sternwarte zu Bonn*). This work contains an enormous number of observations carried out by Argelander and his assistants during the nine years from 1852 to 1861.

AR'GEMO'NE (Lat., an herb, Gk. ἀργεμώνη, *argemōnē*, a kind of poppy). A genus of plants of the natural order Papaveraceæ, distinguished by four to six petals, four to seven radiating concave stigmas, and an obovate capsule, opening by valves at the point. *Argemone Mexicana,* sometimes called Mexican poppy and prickly poppy, is an annual herbaceous plant one to two feet high, with large yellow flowers, and sessile, waved and sinuated, spiny leaves, variegated with white. It is a native of Mexico and of the southern parts of the United States, and is now also common in many tropical and sub-tropical countries, in which it has been naturalized. In parts of Australia it has become a troublesome weed. Its seeds are narcotic, purgative, and diuretic, exhibiting in a strong degree those qualities of the order of which the seeds of the poppy are devoid. They are used in the West Indies as a substitute for ipecacuanha; also instead of opium; and the juice of the plant is employed as a remedy for ophthalmia. This plant is not infrequently to be seen in flower borders in Great Britain and elsewhere; but in the northern parts, at least, the seed is generally sown in a hot-bed. *Argemone platyceras,* a similar species with white petals and a capsule armed with stout spines, is common from Kansas and Nebraska southward and westward. *Argemone grandiflora,* a Mexican species, has large white flowers, and the plant is almost devoid of prickles. All these plants are occasionally met with in gardens.

AR′GENIS. An allegorical romance by John Barclay, published in 1621. It purports to narrate the history of a war waged by Lycogenes, a Sicilian rebel, and Poliarchus, a prince of Gaul, for the hand of the daughter of Meliander, King of Sicily. But under this thin, figurative veneer, one can easily trace a history of contemporary happenings. Poliarchus represents Henry IV., Hyanisbe, Queen Elizabeth, and Radirobanes, Philip II. The book has exerted not a little literary influence. Fénelon's *Télémaque* is modeled after it. It was also the favorite work of Cardinal Richelieu, suggesting to him some of his political moves. Cowper said of it that it was "the most amusing romance that ever was written."

ARGENS, är'zhäN′, Jean Baptiste de Boyer, Marquis d' (1704-71). A French philosophical writer, born at Aix, in Provence. His *Lettres chinoises* (1739), *Lettres cabalistiques* (1741), and *Lettres juives* (1742) attracted the notice of Frederick II., and their author was invited to Potsdam, and in 1744 was made director of fine arts in the Academy of Berlin, with a large salary. Soon he was the friend and daily companion of the King, who liked exceedingly his frank and vivacious character. When almost sixty he married an actress, without Frederick's permission. Deprived of his pension, he returned to Provence and died at Toulon. Among his other numerous writings should be mentioned *Histoire de l'esprit humain* (14 vols., 1765-68), and *Réflections critiques sur les écoles de peinture* (1752).

ARGENSOLA, är'Hĕn-sō′lȧ, Lupercio Leonardo de (1559-1613) and Bartolomeo Leonardo de (1562-1631). Two Spanish poets, sometimes overrated as the "Spanish Horaces." They were born at Barbastro, in Aragon, the elder brother December 14, 1559, the younger August 26, 1562. Both studied at the University of Huesca, and both later enjoyed the patronage of Maria of Austria, widow of the Emperor Maximilian II., who made Lupercio her secretary and Bartolomeo her chaplain. The former was subsequently appointed, by Philip III., historiographer of Aragon. Bartolomeo was commissioned by the Conde Lemos, then president of the Indian Council, to write the *Conquista de las Molucas* (1609); and when that nobleman became viceroy of Naples, both brothers, who had meanwhile acquired fame as poets, were included in his suite, thereby arousing the anger of Cervantes, who had hoped to obtain a like honor. Lupercio died in Naples, in 1613, while filling the office of secretary of state. Bartolomeo succeeded his brother as historiographer of Aragon. He returned to Spain and busied himself with Lupercio's unfinished work, a continuation of Zurita's *Annals of Aragon,* a task which occupied him until his death in 1631. Only the first part, which deals with the years 1516-20, was completed, and treats every detail with such conscientious minuteness as to be wearisome reading. The collected poems of the two brothers were first published posthumously by Lupercio's son, under the title of *Rimas* (Saragossa, 1634), and received from no less a personage than Lope de Vega the indorsement that the authors "had come from Aragon to reform among our poets the Castilian language." Although an overstatement, this verdict indicates the real merit of their verse. They are both models of correct form and pure idiom, with the Horatian model and the classic standard ever before them; yet their influence on the literature of their country was, on the whole, small. Lupercio is also remembered as a dramatist whom Cervantes pronounced almost equal to himself; but of his three known plays, one, the *Filis,* is lost, while his *Isabela* and *Alejandra* show little to justify Cervantes's praise. The best edition of the *Obras sueltas* of both brothers is that edited by Conde de la Viñaza (2 vols., Madrid, 1889), which includes the plays and shorter prose writings.

ARGENSON, är'zhäN'sôN′, Marc Antoine René de Voyer, Marquis de Paulmy (1722-87). A French diplomat and author, son of Louis XV.'s minister of foreign affairs. He was envoy to Poland, Switzerland, and Venice; a member of the Royal Academy, and gathered a library of about 100,000 volumes, which was purchased by the Comte d'Artois in 1785 and became the nucleus of the Bibliothèque de l'Arsenal. He was editor of forty volumes of the *Universal Bibliography of Romance,* in which are some novels of his own.

ARGENSON, Marc Pierre de Voyer, Count d' (1696-1764). A celebrated French statesman, brother of René Louis Voyer d'Argenson (q.v.). After holding a number of inferior offices, he succeeded M. de Breteuil in the War Office in 1742. On the death of Cardinal Fleury, in the following year, the whole care of the war then raging devolved upon him. He found matters in the most deplorable condition. The French troops, decimated by sword and disease, were in full retreat across the Rhine; the Austrians already swarmed in Alsace and Lorraine, and the very political existence of France was imperiled; but Argenson, by his vigor and lucky choice of generals, changed the fortunes of war in the course of one year. After the victories of Fontenoy and Louffeld, and the capture of Bergen-op-Zoom, peace was secured by the famous Treaty of Aix-la-Chapelle, signed in 1748. Argenson, however, did not remain inactive; he introduced reforms in the army, established the *Ecole Militaire* in 1751, and, by various measures, kept alive the military spirit of the nation. He was an illustrious patron of literature. Diderot and D'Alembert dedicated to him their great *Encyclopédie;* and to Voltaire, whose fellow-student he had been, he furnished materials for his *Siècle de Louis XIV*. In 1757 he was exiled to his estate, it is supposed by the machinations of Madame Pompadour. On her death he returned to Paris.

ARGENSON, Marc René de Voyer d' (1771-1842). A grandson of Marc Pierre d'Argenson. A French soldier and statesman. Though he was an aristocrat by birth and possessed immense wealth, he embraced the cause of the Revolution and served as Lafayette's adjutant till the excesses of 1792 drove him from public life. In 1809, while prefect of Antwerp (then Deux-Nèthes), he took part in the expulsion of the English from Walcheren. In 1813 he resigned rather than unjustly confiscate the property of the mayor at the order of the French ministry. He was elected deputy for Belfort in the Hundred Days, and reëlected after the second Restoration. In 1830 he appeared in the Chamber to represent Strassburg, and in 1832 was one of the members who signed the famous *compte rendu*. In 1833 he put his name to the manifesto of the "Society of the Rights of Man." D'Argenson was a man of great charity, a lover of freedom, and fearless in the defense of his principles.

ARGENSON, Marc René, Marquis d' (1652-1721). A member of an ancient French family possessed of a domain in what is now the Department of Indre-et-Loire. Passing through many minor offices, he was made Keeper of the Seal in 1718, and minister of state in 1720. He resigned the same year, and died shortly after. He was a member of the French Academy and an honorary member of the Academy of Sciences.

ARGENSON, René Louis de Voyer, Marquis d' (1694-1757). Minister of foreign affairs for Louis XV. from 1744 to 1747, when he was forced to resign on account of the intrigues of Spain, whose policy he had frustrated in his negotiations with Italy. He was more of a student and idealist than a diplomat, and his ministry was not very successful. After his retirement he devoted himself to literature. He was a profound student of political science, and wrote, among other works, *Considérations sur le gouvernement ancien et présent de la France* (Amsterdam, 1764). His journal and memoirs, in nine volumes, were published at Paris, 1861-67. Consult Ogle, *The Marquis d'Argenson* (Oxford, 1893).

AR'GENT (Fr., silver). The metal silver in heraldry (q.v.).

ARGENTEUIL, ăr'zhäN'tẽ'y'. A town in the Department of Seine-et-Oise, France, twelve miles northwest of Paris (Map: Paris and vicinity). It has manufactures of files, pasteboards, watches, and alcohol. Its priory, now in ruins, was founded in the Seventh Century, and was turned by Charlemagne into a nunnery, of which the famous Héloïse afterward became abbess. Population, in 1901, 17,375.

ARGEN'TEUS CO'DEX. See Ulfilas.

ARGENTINA, är'jĕn-tē'nȧ; *Span. pron.* är'hĕn-tē'nȧ, or Argentine Republic (officially, República Argentina). (From Lat. *argentum*, silver; cf. the name Rio de la Plata, Span., River of Silver.) A federal republic, next to Brazil the largest State in South America (Map: South America, C 6). In the beginning it was styled "the United Provinces of the Rio de la Plata." It is included between latitudes 22° and 55° south, longitudes 53° 30′ and 73° 30′ west, and is bounded on the north by Bolivia and Paraguay; on the east by Paraguay, Brazil, and Uruguay, and the Atlantic Ocean; on the south by the Atlantic; and on the west by Chile, the watershed indicated by the highest summits of the Andes separating the two countries. It forms a blunted wedge-shaped area about 2100 miles long, with a width of nearly 1000 miles at the north and less than 200 miles at the Strait of Magellan. A number of islands are included; the Falkland Islands, off the Atlantic coast, which were at one time claimed by the Republic, are held by Great Britain. The total area, including eastern Patagonia and part of Tierra del Fuego, is about 1,138,352 square miles, divided between fourteen organized Provinces and ten territories.

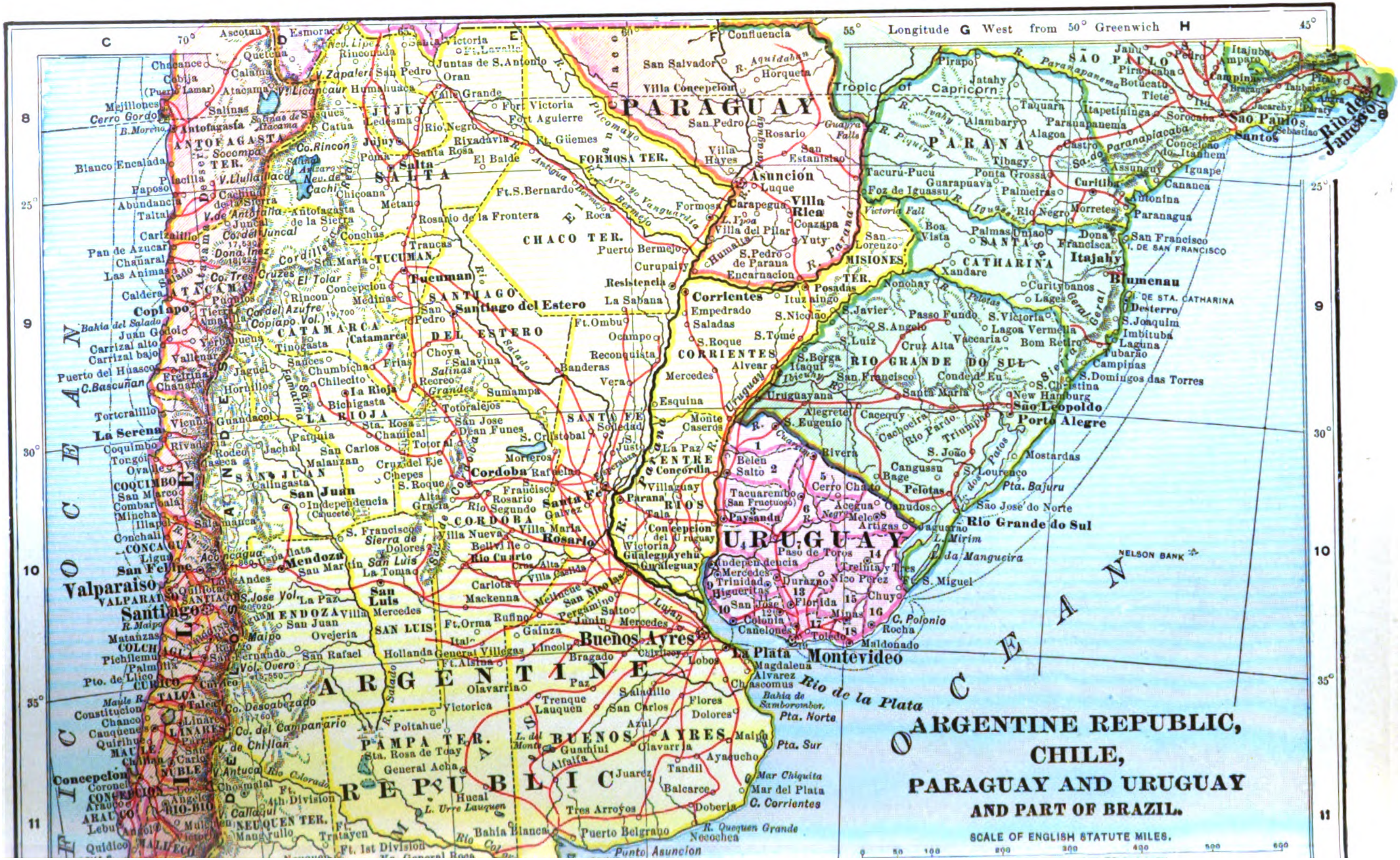
Topography. The surface is diversified by the Andean Cordilleras on the western border, and by the interior highlands; but the greater part of the area is a flat plain sloping gently toward the Atlantic Ocean. The Andes system in the northwest is a broad plateau, broken into parallel or slightly diverging ridges, which reach well to the east of the Chilean frontier, and occupy large areas in the Provinces of Jujuy, Salta, Tucumân, Catamarca, Rioja, and San Juan. Above the plateau rise numerous crests to a height of over 17,000 feet, attaining extreme elevations in Aconcagua (22,860), Mercedario (22,315), Famatina (about 20,700), and Tupangato (20,286). In the western Province of Mendoza, the Andes contract laterally, and gradually fall off in height toward the south, where they end in the highlands of Tierra del Fuego. East of the Cordilleras, the most notable elevations are the north and south ridge of the Sierra de Córdoba, on the western boundary of the Province of Córdoba; the Tandil and Ventana Highlands, in the Province of Buenos Ayres; and the continuation of the mountain range of Lower Brazil, in the Territory of Misiones. These independent mountain ranges, however, are of no great areal or topographic importance; the entire region eastward from the base of the Andean Plateau is generally flat, or slightly undulating, and falls gradually from an elevation of about 2000 feet to, or nearly to, the level of the sea. That part of the plain north of the Rio Salado (affluent of the Paranâ) is called the "Gran Chaco" (great hunting-ground), and contains extensive forests. Between the Rio Salado and the Rio Negro, in central Argentina, are the characteristic pampas, monotonous stretches of level ground covered with grass during the wet season. Northward the pampas graduate into more forested country, and are also marked by a large interior drainage system and by saline swamps, while to the south they merge into the higher plains or steppes of Patagonia, which are disposed at an elevation ranging from 2000 feet at the base of the Andes to 500 feet or less on the coast. Between the Rio Paranâ and the Rio Uruguay are the Provinces of Corrientes and Entre Rios, which are generally low, the latter Province, however, containing a small area of hills in the west.

HYDROGRAPHY. Aside from a few inclosed basins in the interior, the entire area is drained by easterly flowing rivers into the Atlantic. The great river system of the Plata, formed by the confluence of the Uruguay and the Paraná, belongs only partly to Argentina, as both its branches rise in the interior of Brazil, and for a large part of their course flow along the frontiers of Brazil, Paraguay, and Uruguay. The Paraná is of great importance to Argentina as a commercial highway. With the Paraguay, it drains the Gran Chaco, through the channels of the Pilcomayo, Bermejo, and Salado, and also the northern pampas, where in past times there were several important tributaries that are now represented by smaller streams with intermittent flow. The Paraná is navigable by steamers for a distance of about 1200 miles, and by light-draught boats for nearly its whole length. From the confluence of the Paraguay to the sea, the fall amounts only to about 225 feet, so that a slight depression would separate the Plata system into three independent branches—the Paraná, the Paraguay, and the Uruguay. In the central Provinces of Argentina, between the Rio Salado on the north and the Rio Colorado on the south, there is an area of inclosed drainage, with extensive saline marshes, which deposit alkaline salts during the dry season. South Argentina is drained by the Colorado and Negro, both rising on the slopes of the Andes. The drainage basin of the Colorado formerly covered a much larger territory, as the provinces of San Juan, San Luis, and Mendoza were drained by a northern tributary that now ends in a swampy reservoir. Patagonia has several large streams, including the Chubut, Deseado, Salado, and Chico, which receive their water supplies from the slopes of the Andes, where there are numerous glacial lakes. See the articles on PLATA, RIO DE LA; PARANÁ, etc.

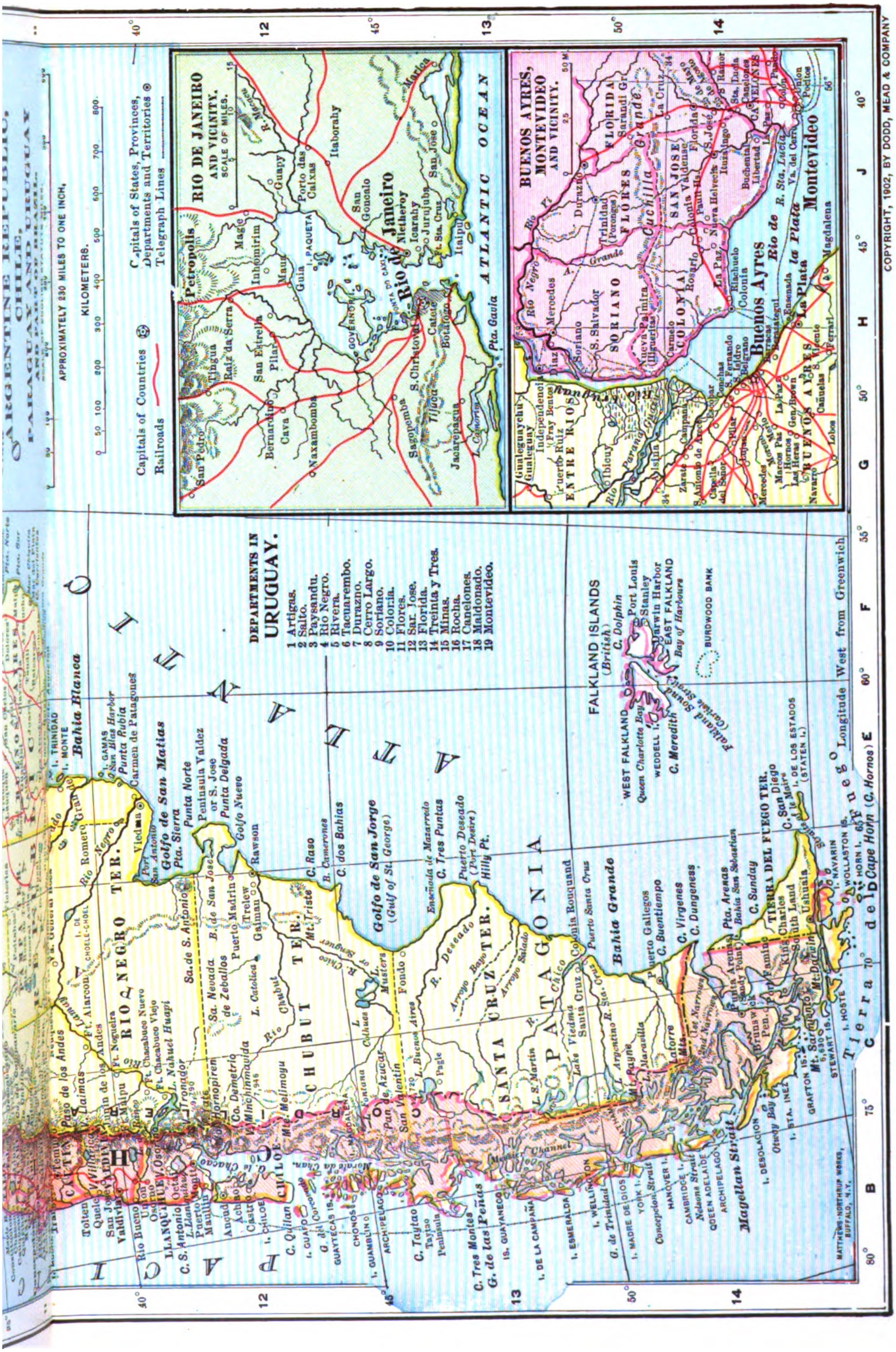
CLIMATE. The northern part of Argentina projects well within the equatorial hot belt, while the central and southern parts extend through the south temperate zone. The peculiar location of Argentina, with oceanic conditions on the east and high mountains on the west, make its climatic details very dependent on the direction of the winds. The northern section lies within the region of prevailing east winds, which convey inland the warm, moist air from the Atlantic Ocean, and cause a very uniform temperature, with heavy precipitation on the coast, but decreasing in amount with progress inland. South of the Plata the west and northwest winds of middle latitudes prevail, and these convey across the narrow territory the air from the Pacific Ocean, which has been deprived of most of its moisture on the windward slopes of the Chilean Andes. Thus the air becomes drier, and the precipitation decreases with approach toward the Atlantic coast. The monsoon-effects considerably modify these general conditions, so that for the northern and more important half of Argentina, in winter, northerly winds are very common.

The temperature decreases with increase of latitude, and varies in the annual average from 70° F. at the north to less than 45° F. at the south. In the north the temperatures range from a maximum of 105° F. to a minimum of 30° F.; the hottest month averages about 80° F., and the coldest month about 55° F. Toward the middle of Argentina the hottest month averages only 75° F. and the coldest a little less than 50° F., and at the extreme south the hottest month averages less than 50° F., and the coldest month has a temperature near that of freezing water. There is in general a great difference between the day and night temperatures; but the intense cold waves of the middle latitudes of the continents of the Northern Hemisphere are entirely lacking. In general, the rainy season is in summer, with a winter season that is dry, even to the utter lack of rain in the interior. Three rain belts lying nearly parallel to the Andes are noticeable; in the extreme northeast the rainfall is moderately heavy, from 50 to 70 inches. To the west of this there is a zone of moderately light rainfall, extending as far south as the mouth of the Plata, where the annual average is about 30 inches. Still farther west there is a rapid decrease to the Andean slopes. On the pampas the weather is variable, changes from the cool, dry south winds to the moist, hot north winds frequently occurring with great suddenness. The former winds, which sometimes blow with stormy violence, are called "pamperos." They come with little warning, and are sometimes of day-long continuance. The moist, hot wind from the north, called "zonda" (somewhat similar to the sirocco), causes intense discomfort to the inhabitants. The dry zonda of the east side of the Andes region is of Föhn character.

FLORA. In the north and northeast are found tropical woodlands, to the south and west of which are scattered forests containing most of the species usual in the warm temperate zone. The slopes of the Andes are well wooded, especially with thorny and shrubby plants, as are the banks of the Paraná and the rivers flowing from the west into the Paraguay; although the trees do not attain great size. Palms are a distinctive feature of the base of the Sierra de Córdoba and of the northwestern foothills. The pampas, in the wet season, are covered with clover and thistles, or with tall grass and flowers, gay verbenas, geraniums, etc.; but here, as well as on the Gran Chaco, there is little to form thickets, except mimosas and cacti. The algarroba, a shrub resembling a honey locust, is widely distributed; it is used for fence posts; from the pulp of the pod are made a kind of flour, and, by fermentation, an intoxicating liquor called Chica. Patagonia has herbs, shrubs, cacti, some tufty grass, brambles, and copse; but is almost treeless, except in the south, and even there but four species of trees are found, two of them being beeches. Among the indigenous trees and plants are the quince, aloe, coca, cinchona, maté (or Paraguay tea), manioc, the prickly pear, with edible fruit; the *Cactus foliosus*, on which the cochineal insect feeds, and a shrub harboring an insect yielding a handsome green dye. The apple-tree, introduced from Chile by the Indians, flourishes in the southwestern Provinces; the grape is extensively grown in the western Provinces of Rioja, San Juan, and Mendoza; the Province of Salta is famed for its bananas and coffee; and the peach, fig, orange, and walnut are grown in many parts. The scarcity of wood in some Provinces compels the



ARGENTINE REPUBLIC,
CHILE,
PARAGUAY AND URUGUAY
AND PART OF BRAZIL.



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use of dry thistles and peach-tree cuttings for fuel.

Fauna. The larger wild animals, found mainly in the northern forests, are the jaguar, puma, ocelot, ant-eater, tapirs, sloths, and peccaries. The pampas and plains are inhabited by deer, wildcats, wild dogs, pumas, skunks, armadillos, the red wolf, foxes, and several burrowing quadrupeds, notably the viscacha. The guanaco, vicuña, and llama range from the mountains to the plains; the capybara and coypu frequent the rivers; the condor, vulture, the Rhea Americana range north of the Rio Negro, and the Rhea Darwinia, south of it. Several species of game birds, and birds of prey, flamingos, and water fowl of many kinds, parrots, humming-birds, and other birds of gay plumage are seen in the forested regions or on the open plains, where bird-life greatly flourishes. There are several varieties of reptiles in Argentina; boas and rattlesnakes occur in the north, together with iguanas, alligators, and turtles. Spiders also and mosquitoes of great size, destructive locusts and ants, and chigoes abound. Fish are very numerous in the coast and inland waters. Seals, sea-lions, and sea-elephants are captured along the coast, and the rivers supply many edible fish. Most interesting fossil remains are found in different parts of the Republic, a large number of species having been obtained, among them the megatherium, toxodon, glyptodon, and gigantic ratite birds.

Geology and Mineral Resources. The interior highlands have usually a granitic core, overlaid by Paleozoic formations, while the Andean system is largely composed of Mesozoic strata, broken through by igneous rocks and covered by extensive volcanic sheets. The pampas are made up of Tertiary sandstone and limestone, with sandy or clayey material on the surface. In Patagonia the northwest and southeast ridges are denuded remnants of former mountain ranges, and rise out of layers of coarse gravel that cover the region to a depth of 50 feet or more. The gravel consists of granite, gneiss, and schist, and has been derived by disintegration and glacial action from the underlying formations. Large areas are also occupied by sand dunes, that shift their position with the winds. The region of the Andes was once the scene of enormous volcanic development, when streams of lava flowed down the slopes and spread out over the adjacent plains in the form of thick and extensive sheets. The lower stretches of the rivers in Argentina are bordered by recent deposits of alluvium. The mineral resources of the country have received but little attention as yet, although they are extensive, and include a large variety of ores and minerals. Gold is found in the Andes and in the mountains of San Luis, coal in Mendoza and Tierra del Fuego, marble in the Sierra de Córdoba, while copper, lead, silver, and iron ores and sodium salts occur at numerous localities. The output of silver annually exceeds $200,000 in value. The gold product in 1904 was valued at $9200. Mica is mined in the mountainous parts of Córdoba, and the product is shipped to European countries. Some petroleum is obtained in Neuquen Territory, and a number of companies are organizing for the further exploration of the mineral resources.

Fisheries. A company has been formed for the exploitation of the unlimited fishing wealth of the waters surrounding the Republic. Its fishing craft have been and are being built in Norway, and early in November, 1904, the pioneer steam trawler sailed under command of Captain Larsen, of the Nordeskjöld South Pole expedition.

Agriculture. This is naturally the most important industry in a country so rich in land and so sparsely settled as Argentina. Although the land under actual cultivation constitutes less than 5 per cent. of the total available area, Argentina already figures as an important factor in the world's grain markets. In 1905 the total land under cultivation was estimated to be not far from 12,000,000 hectares (about 30,000,000 acres); in 1895, at the time of the last census, it was 4,835,620 hectares (nearly 12,000,000 acres); in 1888, at the time of the first agricultural census, it was 2,459,120 hectares (nearly 6,000,000 acres); while in 1872 it was but 580,008 hectares (or about 1,450,000 acres). The area under cultivation, therefore, has increased more than seventeen-fold since 1872. The total available agricultural area is estimated at 300,000,000 acres. The census estimates the number of people engaged in agriculture at one-fourth the entire population.

There were more than 180,000 farms in Argentina in 1895, of which 60 per cent. were cultivated by their owners, 30 per cent. by tenants paying rent, and 8 per cent. by persons working for a share of the crop. Although there are no statistics to show the growth of each of these groups, it is a matter of common observation that the number of farmers owning their land is growing apace, as free land is abundant and its acquisition extremely easy. Renting for a share of the crop is the first step on the part of the agricultural laborer toward becoming a landowner. Land being abundant and population sparse, labor is naturally well rewarded; so that it is a matter of common occurrence for the laborer to get from one-fourth to one-half of the share of the crop, the proprietor furnishing land, implements, and seeds, as well as a house and food for the laborer and his family. Under these conditions, it takes the laborer only a few years to acquire land of his own. In fifteen out of the twenty-three Argentine provinces for which there are figures in the two censuses of the country, the number of farms increased from 43,746 in 1888 to 107,274 in 1895. The average size of farms is about 125 acres, the number of larger plantations and of farms of smaller area being inconsiderable.

The rapid increase in the cultivated area is to a great extent due to European immigration, the newcomers settling in colonies, living in accordance with their own customs, and using their own methods of cultivation. The first colony thus founded consisted of Swiss peasants, who came to Argentina in 1856; in 1874 there were 32 colonies, tilling 12,900 acres; in 1884 the number of colonies increased to 85, the area under cultivation to 86,000 acres; in 1895 the census records 709 colonies, with an area of no less than 115,284,000 acres. Various nationalities are represented in these colonies, including Italians, Russian and Roumanian Jews, and Boers. The wonderfully rapid growth of colonies is explained by the very liberal immigration laws of the Republic, alluring inducements being held out to immigrants, who are given, in some of the provinces, large tracts of land, provisions, and implements with which to begin farming life in the new country.

The most important crop in Argentina, from a commercial point of view, is wheat, maize and flax ranking next in importance. Barley, oats, potatoes, tobacco, and other European crops are also extensively raised. Sugar-cane is cultivated in the northeast with considerable success, and the cultivation of cotton has been recently introduced with fairly satisfactory results; the Louisiana variety seems to thrive best, the average return being one ton per acre. The fruits raised are oranges, olives, figs, grapes, and dates, as well as apples, pears, and plums, and the export of fresh fruit to Europe has been begun. Silk-worm culture, for which the climate seems to be splendidly adapted, is also receiving considerable attention. The following figures illustrate the growth of the agricultural industry in Argentina: In 1888 the area devoted to the cultivation of wheat was 2,014,947 acres, in 1895 it was 5,064,767, an increase of about 150 per cent. in seven years. The area devoted to the cultivation of maize in the corresponding years was respectively 1,980,724 and 3,074,374 acres, showing an increase of over 50 per cent. The area under flax increased from 299,246 acres in 1888 to 957,073 acres in 1895, or more than 200 per cent. Notable as these increases are, they only indicate the initial stages of the expansive movement of Argentine agriculture, as can be seen from the following figures. In 1906 the acreage of the three principal crops was: wheat, 14,018,000; maize, 6,712,000; flax, 2,526,000; while the yield of the crop for the same year was: wheat, 3,882,000 metric tons; maize, 6,500,000 (estimated) metric tons; and linseed, 640,000 metric tons. The area under wheat has shown an increase from 9,273,000 acres in 1904 and 12,711,000 acres in 1905. On the other hand, the area under flax decreased from 3,171,000 acres in 1904 and 2,883,000 acres in 1905. The following are the chief wheat-raising provinces, with their acreage in 1895 and 1905:

	1895 Acres.	1906 Acres.
Santa Fé	2,547,349	3,811,000
Buenos Ayres	907,959	5,950,000
Córdoba	725,733	3,054,000
Entre Rios	721,799	776,000

The increase in the area under sugar-cane has been as follows: 1855, 551 acres; 1875, 7759; 1888, 52,044; 1895, 151,406; 1905, 162,148. The area under tobacco was: 1872, 8551 acres; 1888, 7991; 1895, 39,029; 1905, 47,886. The area devoted to wine culture was 131,589 acres in 1905.

Stock-raising is no less important than the cultivation of land. The following table shows the number of various kinds of animals at the time of the taking of the first and second censuses:

	1888	1895	1904 (estimated)
Cattle	21,961,657	21,701,526	28,000,000
Horses	4,234,032	4,446,859	5,000,000
Asses and Mules	417,494	483,369	.. ..
Sheep	66,706,097	74,379,562	110,000,000
Hogs	393,758	652,766	800,000
Goats	1,894,386	2,748,860	....

It will be seen from the above figures that the raising of sheep constitutes one of the most important branches of the animal industry. Their increase has been steady and large, as the following figures show: In 1830, their total number in the country was estimated at 2,500,000; 1860, 14,000,000; 1870, 41,000,000; 1880, 61,000,000. As to the wool product, it increased from 6,000,000 pounds in 1830 to 130,000,000 in 1870; from 310,000,000 in 1891 to about 500,000,000 pounds in 1900. The significance of these figures will be clear if it is remembered that in the United States there were only 42,000,000 sheep in 1895, a number which did not increase up to 1900. On the other hand, the number of cattle in the United States is double that in Argentina. Dairying has made great advances in recent years. The annual production of milk is estimated at about 960 million litres (about 871,700,000 quarts), of which about 420 million are converted into 15,000 tons of cheese, 8000 tons being exported. In 1894 only 19½ tons of butter were exported from the country, but in 1904 there were exported 5300 tons, the bulk of it going to Great Britain and South Africa. The greater part of the dairies and cheese factories are located in the province and city of Buenos Ayres.

Manufactures. The manufacturing industries of Argentina are largely in foreign hands. This is especially true of the larger industries, requiring investments of considerable capital and management on a large scale, such as electric-light and power plants, flour mills, mines, smelting works, etc. The census of 1895 reported in the country 22,204 manufacturing establishments, 18,706 of which belonged to foreigners, and 3498 to natives. The proportion of native workmen in these establishments was more than one-third of the total number of 145,650, 52,356 being Argentinians, and 93,294 foreigners. The number of women workers engaged in the manufacturing industries was 22,911. The total number of people engaged in manufactures, including employers and employees, was 167,854, and the capital invested was 284,101,367 gold pesos (about $280,000,000).

The manufacture of food products is foremost among the industries and employs a capital of over $72,400,000. The two largest industries of the country that have contributed more than any others to its prosperity are the flour mills, employing a capital of about $20,000,000, and the meat-packing houses, with a capital of more than $22,000,000. Sugar plantations and refineries employ a capital of over $17,000,000; the wine-making establishments employ a capital of $8,500,000; breweries, a capital of nearly $3,000,000; distilleries, a capital of over $5,000,000. The growth of the flour-milling industry is shown, not so much by the increase in the total number of flour mills—from 638 in 1888 to 659 in 1895—as by the increase of steam driven mills from 189 in 1888 to 234 in 1895, accompanied by a shutting-down of mills driven by animal power, which numbered 173 in 1888 and only 56 in 1895. It is the only industry, too, in which the proportion of native owners is comparatively high—viz., 344 out of a total of 659. In 1905 the total number of manufacturing establishments, including small workshops, had risen to 25,000, the number of employees to 166,000, and the capital employed to over $321,000,000.

These facts illustrate the direction taken by the development of Argentine industry—viz., the building up of those branches of manufacture in which the natural products of the country can be converted into more valuable finished or half-finished products. As a consequence, the country is being gradually relieved of the necessity of paying a tribute to foreign nations for articles of prime necessity, and employment is provided in the country for a large and steadily increasing number of people. The growth of the sugar-refining industry is a case in point. Previous to 1870 the country imported annually some 22,000 tons of sugar, and hardly produced 1000 tons at home; in 1905 the home product rose to 137,095 tons, and over 14,000 tons were exported. Among the industries carried on on a large scale, the manufacture of gas should be mentioned. It is almost exclusively in foreign hands (largely English), and in 1895 there was invested in it a capital of nearly $40,000,000. Electric-lighting plants have made much less progress, the capital invested in such plants in 1895 being only $1,000,000. The more distinctive native manufactures are those of baskets from the willows of the Paraná Islands; the homespun cotton and woolen cloths, blankets, rugs, laces, and embroideries of the northwestern highland provinces; the tanned leather, wooden ware, laces, blankets, etc., of Córdoba; and the harness, belts, ponchos, horse-blankets, ropes, etc., of the Indians in various States. The growth and diversification of Argentine industries are best brought out by the following table, showing the absolute and relative values of the products of the various branches of industry exported from the country at three different periods:

Value in gold pesos (96.5 cents).

Products	1872 Pesos	per ct.	1895 Pesos	per ct.	1905 Pesos	per ct.
1 The Animal Industry	43,340,000	94.7	74,630,000	62.1	141,043,000	43.7
2 Agriculture	98,000	0.4	41,450,000	34.5	170,235,000	52.6
3 All other Industries	2,332,000	4.9	3,990,000	3.4	11,566,000	3.7
Total......	45,770,000	100.0	120,070,000	100.0	322,844,000	100.0

Thus the value of animal products, which formerly made up nearly the entire amount of its exports, has dwindled to less than two-fifths, while agricultural products have risen from next to nothing to over one-half the total value. The small export of manufactured products does not indicate lack of industrial progress, since the manufactures go mainly to satisfy the home market, and do not appear in the above table. It should also be borne in mind that in 1905 quite a considerable fraction—27,523,000 pesos' worth—of animal and agricultural products was exported in a finished state, e.g., flour and packed meats.

COMMERCE. Being an agricultural country, with the manufacturing industry still in its infancy, Argentina must on the one hand import most of the manufactured products needed by its people, and on the other hand seek to dispose of its enormous agricultural surplus to the nations of Europe. Of the total imports brought into the country, manufactured articles of all kinds constitute more than 86 per cent., while vegetable and animal substances constitute less than 13 per cent.; and even these include many manufactured products, such as refined sugar, cigars and cigarettes, dried fruit, manufactures of rubber, and preserved meats. Making allowance for such articles, the value of really crude products of the farm barely exceeds 1 per cent. of the total imports; on the other hand, the only manufactured articles exported from Argentina consist of products of the farm and mine, such as refrigerated meat, washed wool, hides and furs, lard, animal oil, linseed oil, flour, copper bars, etc. The imports into Argentina, in the order of importance, are textiles and apparel, iron and iron manufactures, food substances, wood and wood manufactures, coal, coke, oil, drinks, chemicals, paper and paper manufactures, etc. The trade with Europe has been facilitated by the establishment of branches of foreign mercantile houses in Argentina.

Since British capital has contributed more to the development of the material resources and the industries of Argentina than the investments of any other nation, Great Britain naturally gets the lion's share of Argentina's trade. The principal countries sharing in the import trade of Argentina are: Great Britain, Italy, Germany, the United States, France, Belgium, and Brazil. Of those taking Argentine products, the most important are: Great Britain, Germany, France, Belgium, the United States, and Brazil. The growth of Argentine trade is shown by the following figures:

	(Millions of Pesos.) Imports.	(Millions of Pesos.) Exports.
1870.	38.50	29.6
1880.	43.10	54.9
1885.	92.25	83.9
1890.	142.25	100.8

Early in 1890 a severe commercial and financial crisis struck the country, from the effects of which it took her several years to recover. The following figures show the downward movement of the trade within the few years following 1890, marked especially by a sudden shrinkage of imports, and the gradual recovery:

	Imports in pesos.	Exports. Peso equals 96.5c.		Imports in pesos.	Exports. Peso equals 96.5c.
1891	67,207,000	96,703,000	1896	112,164,000	116,802,000
1892	97,899,000	114,667,000	1900	113,485,000	154,600,000
1893	100,913,000	94,906,000	1904	187,305,969	264,157,525
1894	92,789,000	101,250,000	1905	205,154,000	322,844,000

The growth of the trade with the United States during the last half century is shown by the following figures:

	Imports into Argentina from the United States.	Exports from Argentina into the United States.
1850.	$800,000	$2,700,000
1860.	900,000	4,000,000
1870.	2,500,000	6,400,000
1880.	1,900,000	6,200,000
1890.	8,900,000	5,400,000

The crisis of 1890 had a similar effect on the trade with the United States as it had on the general trade of Argentina, the decline continuing for several years. Since 1896, however, the trade has again been increasing as follows:

	Imports.	Exports.
1896	$6,000,000	$9,300,000
1900	11,600,000	8,100,000
1904	16,900,000	9,800,000
1905	28,920,000	15,717,000

The trade with the United States increased, not only absolutely, but also relatively. In 1896 the imports from the United States constituted 9.9 per cent. of the total imports; in 1900, 11.9 per cent.; in 1904, 12.8 per cent.; and in 1905, 14.1 per cent. The exports from Argentina to the United States were 8.0 per cent. in 1896, 5.2 per cent. in 1900, and 4.8 per cent. in 1905. The chief articles of import from the United States are machinery and all kinds of tools and implements, having an annual value of some $4,500,000. The value of agricultural implements alone is about $5,000,000 annually; that of oil (illuminating and lubricating) is nearly $2,500,000; that of boards, wooden manufactures, and lumber exceeds $2,500,000, and that of manufactures of linen, hemp, and jute is over $1,600,000. The chief articles of export to the United States are wool, valued, in 1905, at more than $7,700,000 (a decline from $20,000,000 in 1897); and hides and skins, valued, in 1904, at nearly $5,200,000 (a decline from nearly $6,000,000 in 1896).

Transportation and Communication. *Shipping.*—The foreign trade of Argentina is carried on chiefly in foreign vessels, mostly British and German. In 1902, 2084 vessels (exclusive of the coasting trade) with a total tonnage of 3,740,855 entered the ports of the Republic, and 2,196 ships with 3,973,781 cleared them. The merchant shipping bearing the Argentine flag consisted in 1905 of 131 steamers with a net tonnage amounting to 55,561, and 161 sailing vessels carrying 40,581 tons; vessels with a tonnage less than 50 are not included in this enumeration.

In September, 1905, the Chamber of Deputies passed a bill looking to the establishment of a direct line of fast steam is between Argentina and European ports. The vessels will fly the Argentine flag and will be liable to requisition for war service. In return the Government will grant a subsidy of 28,000 pesos gold for every double journey.

Railways. Perhaps in no other field has the economic progress of Argentina been so well exemplified as in its railway development. Argentina has a larger railway mileage than any country in America south of the United States, although it has only half the area and about one-fourth the population of Brazil, and less than half the population of Mexico. The railway mileage in 1900 aggregated 10,595 miles, being distributed among 26 lines. In 1905 the railway mileage in operation was 12,231, and new lines aggregating over 1500 miles were under construction. In 1900 four were owned and operated by the nation, six were owned and operated by the provinces, with a mileage of 8 per cent. of the total; the rest were managed by private companies. The first railway in Argentina was built in 1854, and extended for about 12 miles west of Buenos Ayres. In 1860 there were 19 miles of railway. In 1870 there were 454 miles, including the Central Argentina Railway, extending from Rosario on the Paraná River to Córdoba in the heart of the country. Between 1870 and 1880 were constructed the great trunk lines leading north from Córdoba to Tucumán, and from Villa Maria to Villa Mercedes, bringing the mileage in 1880 up to 1434. The decade that followed eclipsed all previous records, and the mileage was increased four-fold, reaching a total of 5860 in 1890. By that year the country was covered with a network of railways branching out from the three great industrial centres on the Paraná River—Buenos Ayres, Santa Fé, and Rosario. On the south, the railway reached the sea at Bahía Blanca; on the west, it was extended to Mendoza at the foot of the Andes, and not far from the Chilean boundary; on the north, to Salta, also close to Chile. Finally, in the decade between 1890 and 1900, the mileage was nearly doubled, one line stretching southward as far as Neuquen, another, the Trans-Andean, being opened from Mendoza to Punta de las Vacas.

On the economic side Argentina did not escape the experience which has been the lot of all countries where railway building has been allowed to go unchecked under private management. Excessive issue of capital stock, over-speculation, and kindred abuses accompanying the great railway "boom" of the eighties had their day of reckoning, and contributed in no small share to the great commercial panic of 1890, when the Government found it impossible to pay interest on railway securities guaranteed by it. It was that experience that led to the gradual withdrawal of guarantees to railways, and the radical reform in railway management which culminated in the creation of a special Ministry of Railways, a sharp supervision of railway management, and a strong tendency toward government ownership and management of railways. Of the existing trunk lines of the country five, with a mileage of 1500, were built by the national Government at a cost of 80,000,000 pesos gold (about $76,000,000); three lines, with a mileage of 1240, were built by the three richest provinces—Buenos Ayres, Santa Fé, and Entre Rios—at a total cost of 56,000,000 pesos ($53,000,000). In a word, more than one-fourth of the total railway mileage in the country has been built by the national and provincial Governments. While the cost of the Government railways has been about 28,650 pesos per kilometre, that of the private lines has been 35,320 pesos per kilometre. In all, the Government paid out over $44,000,000 in guarantees for private roads. At the end of 1898 the total capital invested in Argentine railways amounted to 523-000,000 pesos, of which 435,000,000 pesos represented private roads; 55,000,000, national railways; and 33,000,000, provincial railways. The railways employed over 37,000 men in 1898 as against 20,000 in 1893. At the beginning of 1906 the total invested capital amounted to 589,000,000 pesos.

Telegraphs. About one-half of all the telegraph lines belong to the Government, less than a tenth to private companies, and the rest to the railways. There were 29,397 miles of telegraph lines in Argentina in 1902 as against 20,415 miles in 1891, and 15,125 miles of telegraph were operated by the Government in 1904. A "snow cable" connects Buenos Ayres with Valparaiso, whence a submarine cable connects with San Francisco, Cal. Buenos Ayres is connected with Montevideo by submarine cable, and also with Europe by way of Rio de Janeiro and the Cape Verde Islands; and in this indirect way with the United States also. There is besides a cable between Buenos Ayres and Lisbon.

Banking. The first bank established in Argentina was the Banco de la Provincia Buenos Ayres, opened in 1822. It was followed by a number of other banks, but none of them managed to exist long, as the insignificant commerce of the country was not sufficient to maintain such institutions. The real banking history of the country dates from 1872, when the Banco Nacional, with a capital of 50,000,000 pesos, was founded. In 1882 the first foreign bank, the Banco Italiano del Rio de la Plata, was established, and the growing commerce of the country soon led to the establishment of French, German, and Spanish banks, which the respective nations established in the interests of their own commerce. By law of November 3, 1887, national banks, resembling those of the United States, were established. The creation of these banks without proper safeguards thrown around them, followed by great abuse of the inadequate law by Government officials, soon resulted in flooding the country with worthless paper money. Speculation on a scale that left far behind the worst features of the German *Gründer* fever in the early seventies, and resembling much the excesses of the days of John Law (q.v.) in France, gave the country for a time the appearance of genuine prosperity; the "boom" was skilfully utilized through the medium of the Paris Exposition of 1889 to attract still more foreign capital, and the scramble for wealth went on, until it culminated in the financial panic. The panic swept away the numerous national banks, most of which had nothing but paper and a political "pull" with the directors of the National Bank at Buenos Ayres as their chief assets. The National Bank itself, robbed of its capital by its directors and by politicians, was declared insolvent, and was reorganized in 1891, under the name of the Banco de la Nación Argentina, with a capital of $50,000,000 paper. In addition, there are 14 State banks. In 1899 the paper peso was fixed by the Congress of Argentina at .44 of the gold peso, thus contributing to the stability of the currency.

GOVERNMENT. The constitution of Argentina, adopted in 1853, and modified in 1860 and in 1898, is modeled closely upon that of the United States; and the entire system of government, both federal and provincial, is almost identical in its chief features with our own. The legislative power is vested in a Congress consisting of a Senate and a House of Representatives. The Senate is composed of 30 members, elected 2 each by the legislatures of the 14 provinces, and 2 by the city of Buenos Ayres. They serve for nine years, but one-third of the Chamber passes out every three years. The Lower House consisted in 1901 of 133 members, elected directly by the people for a term of four years, one-half of the House being renewed every two years. To the House of Representatives is reserved the right of initiating bills dealing with taxation and military conscription, and of impeaching the national executive and judiciary. The executive power is vested in a President, elected for a period of six years by the same method as that pursued in the United States, except that the number of electors chosen by each Province is twice the number of its representatives in Congress. The President acts through his ministers, eight in number, who preside over the Departments of the Interior, Foreign Affairs and Worship, Finance (Hacienda), Justice and Public Instruction, War, Navy, Agriculture and Public Works. The ministers may appear and speak in Congress, though they have no vote, and are responsible for the acts of the chief executive, whose decrees they must countersign separately or jointly. Through the ministers, the President may initiate legislation in either house. The Supreme Court of the Republic consists of five judges and an attorney-general, appointed by the President, with the approval of the Senate. It exercises similar jurisdiction to that of the United States Supreme Court.

The Provinces, fourteen in number, have each their own constitution, and exercise complete control over their own affairs. They possess even greater power than the States of our Union, in that they may conclude treaties (with the consent of Congress), for the fostering of industry, immigration, colonization, railways, and canals. The governor is elected directly by the people for a period of three or four years. The national domain is divided into ten Territories, controlled by Congress, and ruled by governors appointed by the President. When a territory acquires a population of 30,000 it is granted the power of choosing a legislature, and when its inhabitants number 60,000, it must of right be admitted as a Province with boundaries determined by Congress. For purposes of administration and police, the Republic is divided into 425 departments and 1750 districts. The national capital is Buenos Ayres.

LOCAL GOVERNMENT. Every community of more than 1000 inhabitants may be erected into a municipal corporation. In the Provinces of Buenos Ayres, Santa Fé, Entre Rios, San Juan, and Corrientes, the municipalities are supreme in the sphere of local government, and are amenable to the Province or court only in case of a violation of a general law. The municipal presidents and councils are elected by the people, except the *intendente* (governor) of Buenos Ayres, which comprises the Federal District, who is appointed by the President of the Republic. In the other provinces the municipalities are subject to inspection and regulation by the Government officials and judicial authorities. Foreigners are eligible to any municipal office.

IMMIGRATION AND EMIGRATION. Since 1857, when the statistics of incoming foreigners were first taken, there has been a growing stream of immigration, which swelled the country's population in the period 1857-1905 by 2,065,869 people. Immigration received a great setback in 1890, and although it has been recovering since that year it has not yet reached the high-water mark of the year preceding the crisis. In 1889 the total immigration into the country was 261,000. In the following year there was a drop of one-half, the total immigration in 1890 being 132,000. In 1891 there was a further drop to 52,000, but since then there has been a gradual increase, the total immigration in 1905 reaching 221,622. The emigration from the country, which was 40,600 in 1889, rose to 83,000 in 1890; in 1905 it was 82,762, and during 1857-1905 it totalled 1,321,826, leaving the net balance of immigration given above. About 45 per cent. of the immigrants are Italians, about 25 per cent. Spaniards, the rest being made up of the various nationalities mentioned below under POPULATION.

The Argentinians have long understood the great value of immigration to a naturally rich and fertile, but sparsely settled country like their own. Hence their great efforts to attract foreign labor, as well as foreign capital, to their country. In addition to very liberal immigration laws, and generous distribution of land to colonists, enormous sums of money have been spent in bringing over and aiding immigrants before they are able to support themselves. Besides the sums thus spent by the Province of Buenos Ayres and by the private Colonization Association, the national treasury has been spending annually from one to three-quarters of a million pesos during the last decade of the century, and on the average a sum close to a quarter of a million annually since 1870. The number of people gratuitously brought over, lodged, and finally settled at public expense in the forty years from 1857 to 1897 was 897,805, 697,398, and 576,396, respectively. To what extent the free distribution of land to immigrants and the planting of agricultural colonies have added to the national wealth has already been shown under *Agriculture*.

EDUCATION. The public-school system of Argentina was admirably organized by President Sarmiento (1868-74), but on the whole it has not been kept up to the standard he set for it. Primary education is free and obligatory for all children between the ages of 6 and 14. The elementary schools are supported by the individual provinces, although subsidized by the Federal Government. They are under the general control of Provincial boards of education, while the details of administration are left to district school boards. The schools in the Territories and the Federal district are managed by a National Board of Education under the supervision of the Minister of Justice and Public Instruction. Besides the regular elementary schools, there are kindergartens, schools for adults, and in sparsely settled districts, ambulatory schools. In some of the provinces, and in the Federal schools, religious instruction of any kind may be imparted outside of school hours; in others only the Catholic faith must be taught; in one, Entre Rios, no religious instruction is permitted. In 1905 there were 5250 primary schools, with 544,000 enrolled pupils, but a far greater number of children were receiving no instruction, and illiteracy is widely prevalent. Secondary education is provided for by 16 lyceums and 35 normal schools, under the control of the general Government, and higher education by national universities at Buenos Ayres and Córdoba, and provincial universities at La Plata, Santa Fé, and Paraná. There are also a school of mines, a college of agriculture, and a naval and military school.

RELIGION. The constitution guarantees freedom of religion to all, but makes the Roman Catholic faith that of the State. The country is divided into five dioceses and one archiepiscopate. The Government builds churches and supports the Catholic priesthood, but it controls all ecclesiastical appointments, and sanctions or rejects the decrees of the Papal See. Marriage was made the subject of a civil contract in 1888. The native Argentinians are nearly all Roman Catholics. Of the 3,954,911 people returned by the census, 3,921,136 were Catholics, 26,750 Protestants, 6085 Jews, and 940 belonged to other denominations.

FINANCE. The economic progress of Argentina has been accompanied throughout its course by extremely unfavorable financial conditions. The chief cause of the unsatisfactory state of public finance has been the inordinate increase of expenditure, which was incurred without reference to the capacity of the people to shoulder new burdens. All thoughtful students of Argentine affairs unite in the opinion that the politicians of the country embarked with too light hearts on all kinds of undertakings—some productive, others wasteful and useless, and, to make matters worse, the administration of the budget was until recently extremely loose. In 1870 the total budget of the Government was $12,635,000; in 1880 it was $16,815,000, or an increase of 33 per cent. in one decade; in 1890 it was $71,508,000, or a further increase of 325 per cent.: and in 1900 it was $95,000,000 paper and $33,000,000 gold, or reducing it all to a paper basis, $194,000,000, or a further increase of 171 per cent. Dr. Albert B. Martinez, formerly Assistant Minister of Finance, ascribes the great increase in public expenditure to the following principal causes: (a) Increase of administrative functions, due to rapid growth of population; (b) increase of public debt; (c) depreciation of paper money; (d) wars, foreign and civil; (e) guarantee by the State of the payment of interest on costly public works; (f) imperfect administrative machinery; (g) defective control of public expenses, etc. In 1890, on the eve of the great financial crisis, the revenues of the Republic amounted to $73,408,000 paper, as against an expenditure of $92,854,000. The enormous deficit, together with the general unsettled financial condition of the country, forced the Government to suspend payment on the national debt, and during the following years the revenue continued to decline. Although since 1895 the revenue has been steadily increasing, the expenditure was frequently in excess of it, as is shown by the following figures:

	REVENUE		EXPENDITURE	
	Pesos (paper).	Pesos (gold).	Pesos (paper).	Pesos (gold).
1895	29,000,000	29,800.000	83,900,800	24.200,000
1900	67,100,000	46,000,000	95,400,000	32,900,000
1902	59,500,000	40,200,000	94,000,000	41,400,000
1903	65,500,000	46,600,000	95,700,000	35,100,000
1904	70,000,000	52,300,000	104,200,000	25,600,000
1905 *	63,439,000	43,461,000	105,582,000	24,865,000
1906 *	69,502.000	44,520,000	116,143,000	23,946.000
1907 *	131,685.000	28,699,000	88,954,000	50,250,000

* Estimated, ordinary.

Of the total revenue, import duties furnish about three-sevenths, the remainder being derived from excise taxes on spirits, wines, and tobacco (one-fifth), land and stamp taxes (about 7 per cent. of total revenue), proceeds from railways, telegraphs, and posts, about 6 per cent. of revenue), and a number of other taxes. The increase of internal taxation took place in the early nineties to put a stop to the growing deficits, and to put the country in a position to resume payments on the debt. The growth of the Argentine debt during the last three decades of the century was in round figures as follows: 1870, $47,000,000; 1880, $85,000,000; 1890, $353,000,000; 1900, $440,000,000. At the beginning of 1906 the external debt amounted to $320,379,000 gold, and the internal debt to $53,865,000 gold, besides a floating debt and paper currency amounting to $246,663,000.

The annual service of the debt requires about $27,000,000 in gold, or nearly three-sevenths the revenue of the country. That the Government was unable to meet its obligations is shown by the frequently recurring deficits. According to the agreement entered into by the Argentine Government with Lord Rothschild in 1893, it was practically relieved from payment of interest for five years (the interest for that period being converted into a new debt), and was to pay interest alone from 1898 to 1901. On January 12, 1901, the full payment of interest and sinking funds was to be resumed. Notwithstanding the respite thus secured, the finances of the Government in 1901 continued to be as little satisfactory as before 1893. The chief items of expenditure are: For the army and navy, service of the public debt, Department of the Interior, Department of Justice and Public Instruction, and Department of Finance. In July, 1905, the internal 6 per cent. debt was converted into a 5 per cent. one. It is also planned to unify the external debt and to reduce the 6 and 5 per cent. loans to a basis of 4 and 4½ per cent.

National Defense.—See Argentina, under ARMIES and NAVIES.

Weights, Measures, and Money.—The metric system was officially adopted in 1887. Gold is the standard of value. A gold peso ($) equals 96.5 cents in United States money. A peso has 100 centavos. The paper peso is equal to 44 centavos gold money.

POPULATION. The following table shows the population of Argentina by Provinces for 1869 and 1895.

Provinces.	Population 1869	Population 1895.	Area in Square Miles.
1. Eastern Littoral.			
Buenos Ayres (city).	187,346	663,854	72
Buenos Ayres	307,761	921,168	117,809
Santa Fé	80,117	397,188	50,929
Entre Rios	134,271	292,019	28,792
Corrientes	129,023	239,618	32,586
Total 1	838,518	2,513,847	
2. Central.			
Córdoba	210,508	351,223	62,176
San Luis	53,294	81,450	28,542
Santiago del Estero	132,895	161,502	39,774
Total 2	396,697	594,175	
3. Western Andes.			
Mendoza	65,413	116,136	56,517
San Juan	60,319	84,251	33,724
Rioja	48,746	69,502	34,555
Catamarca	79,962	90,161	47,544
Total 3	254,440	300,050	
4. Northern.			
Tucumán	108,953	215,742	8,928
Salta	88,933	118,015	62,200
Jujuy	40,379	49,713	18,981
Total 4	238,265	383,470	
Territories (northern).			
Misiones		33,163	515,867
Formosa		4,829	
Chaco		10,422	
Los Andes			
Total		48,414	
Central.			
Pampa		25,914	
Western.			
Neuquen		14,517	
Southern.			
Rio Negro		9,241	
Chubut	153	3,748	
Santa Cruz		1,058	
Tierra del Fuego		477	
	153	14,524	
Total 5	153	103,369	
Total population	1,728,073	3,954,911	
Population not returned by census		60,000	
Indians	93,138	30,000	
Total	1,821,211	4,044,911	
Argentinians abroad	47,276	50,000	
Grand Total	1,868,487	4,094,911	1,138,352

Thus there was an increase of 2,217,421, or 121 per cent. in 26 years. The urban population constituted 34.6 per cent. of the total population of the country in 1869, and 42.8 per cent. in 1895, thus keeping pace with the industrial development of the country. Only in three European countries, viz., England, Germany, and Italy, is the percentage of the urban population greater than in Argentina. In the United States, the urban population constituted 32.9 per cent. of the total in 1890, and 37.3 per cent. in 1900. Of the 3,954,911 persons reported by the census, 2,088,919 were males, and 1,865,992 females, the great excess of males being a common phenomenon in young countries attracting large numbers of immigrants. There were 2,950,384 natives, as against 1,004,527 foreigners, or in other words, more than one-third of the population consisted of immigrants, among whom the proportion of males to females was about 7 to 4. The best represented nationalities among the foreign population were: Italians, 492,636; Spaniards, 198,685; Frenchmen, 94,098; and South Americans (Brazilians, Chileans, etc.), 117,000. Next in order were Englishmen, Germans, Swiss, and Austrians, ranging from 21,788, to 12,803. The Indians seem to be fast dying out, their number having dwindled from more than 93,000 in 1869, to 30,000 in 1895. The density of population increased from 1.6 per square mile in 1869, to 3.7 per square mile in 1895, ranging in the latter year from 0.16 per square mile in the western territory of Neuquen, to 11.1 in the Province of Buenos Ayres.

At the end of 1905 the population of Argentina was estimated at 5,678,197, an increase since 1895 of 30 per cent.

HISTORY. The river Plata was entered in 1516 by Juan Diaz de Solis, who was searching for a southwest passage to the East Indies, and in 1527-28 Sebastian Cabot ascended the Paraná to its confluence with the Paraguay, giving the name La Plata (silver) to the latter stream, from the stories of hoards of silver which he heard from the Indians, who told him that the metal came from the headwaters of the river in the west, i.e., Peru. At the junction of the Carcarañá and the Paraná, above the present site of Rosario, he built a fort. In 1535 Don Pedro de Mendoza visited the new country, and founded Buenos Ayres, which was abandoned by the colonists in 1536, and was not permanently established until 1580. Meanwhile Asunción (1536), Santa Fé (1573), and other places had been settled, and horses and cattle had been introduced. Spanish colonists from Peru had founded cities in the northwest, Tucumán (1565), and Córdoba (1573), and down to 1776 the basin of the river

Plata was a dependency of the viceroyalty of Peru. In that year the viceroyalty of Buenos Ayres was formed, including Bolivia, Paraguay, and Uruguay, and the country was governed by viceroys until 1806, when, during the war of France and Spain against England, Buenos Ayres and Montevideo were occupied by the English. Buenos Ayres, however, was recaptured by the inhabitants, who, forced to defend themselves, saw the need and advisability of independence of the mother country. Accordingly, they refused in 1808 to acknowledge Joseph Bonaparte as King of Spain, and in 1810 the struggle for independence began. A provisional government was instituted under a *junta gubernativa*, which was replaced early in 1814 by a "Supreme Board of the United Provinces," under the virtual control of one man, Antonio de Posados. Civil strife followed, and in 1816 a general congress declared the independence of the "United Provinces of Rio de la Plata," though this was not substantially attained without war (1817-24), and was not recognized by Spain until 1842. During 1826-28 there was war with Brazil for the possession of the Banda Oriental (Uruguay), which in 1828 was finally recognized by both as an independent State, and from 1827 to 1831 the Plata provinces were practically isolated from each other. In 1831 Buenos Ayres, Entre Rios, Corrientes, and Santa Fé formed a federal compact, and invited the others to join them; but anarchy resulted till 1835, when General Rosas (q.v.) was installed as dictator. His efforts to make Buenos Ayres supreme led to his downfall in 1852. In 1853 a constitution, still in force, was adopted for the "Argentine Republic," but Buenos Ayres refused to accept the document, and in 1854 declared itself independent, but was defeated in 1859, and obliged to reënter the Confederation. Hostilities were soon renewed (1861), however, and though the province did not again become independent, it increased greatly in relative importance, and the city of Buenos Ayres supplanted Paraná as the capital of the Confederation. During 1865-70, under the presidency of General Mitré and of Sarmiento, a war was waged against Paraguay by the Argentine Republic, Brazil, and Uruguay, with little benefit to the Republic. In 1881 a treaty was made with Chile by which Argentina acquired all the country east of the Andes, comprising Patagonia and the eastern part of Tierra del Fuego. In July, 1890, a revolution broke out, aided by the army and navy—the result of the political and financial corruption of the cabinet officers and the stagnation in business produced by debasement of the currency. President Celman was forced to resign, and was succeeded by Dr. Carlos Pellegrini, who held office until October, 1892, when Dr. Luis Saenz-Peña was inaugurated. Saenz-Peña made a vigorous effort to put the country on a proper financial basis, conditions having continued very bad since the failure of the Barings, which was largely brought about by their extensive dealings in unproductive Argentine securities. Repeated political disturbances at the various provincial capitals, however, prevented any successful financial reorganization or sufficient commercial improvement, and in January, 1895, Saenz-Peña resigned, and the Vice-President, S. José Uriburú, took the executive chair. He held office until 1898, when Lieut.-Gen. Julio A. Roca, who had occupied the place between 1880 and 1886, was again elected President. The dispute with Chile over the boundary in the Atacama region was submitted for arbitration to the United States minister at Buenos Ayres, whose decision rendered in March, 1899, gave to Argentina about 25,000 square miles of territory with 1164 inhabitants. The question of the Patagonian boundary was settled in November, 1902, after years of controversy, by the decision of a commission appointed by the King of Great Britain to whom the two countries submitted their claims. Of the disputed area Argentina received about 15,600 square miles and Chile a little over 21,000 square miles. The delimitation of the boundary was concluded in March, 1903. In May, 1902, the two governments entered into an agreement providing for a cessation in the increase of naval armaments and the ultimate establishment of an equilibrium between the two fleets. Dr. Manual Quintana, who assumed the presidency Oct. 12, 1904, was active in advocating measures looking to the improvement of the finances and the industrial life of the nation. In July, 1905, Congress passed a law providing for the conversion of the internal debt, and a measure providing for the conversion of the foreign debt was adopted by the Chamber in August. A military insurrection in the provinces of Buenos Ayres, Santa Fé, and Córdoba, early in February, was suppressed in the course of a few days. An abortive uprising occurred in Santiago del Estero in June. In August an anarchist attempt was made on the life of the president. Strikes among the harbor and railroad employees led to the proclamation of a state of siege in October. President Quintana died in March, 1906, and was succeeded by the vice-president, Dr. Figuerva Alcorta.

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AR′GENTINE. A city in Wyandotte County, Kan., three miles from Kansas City, on the Atchison, Topeka, and Santa Fe Railroad (Map: Kansas, H 2). It is a suburb of Kansas City, and has zinc and chemical works, an ice manufactory, three grain elevators and extensive railroad repair shops. Pop., 1890, 4732; 1900, 5878; 1905, 6054.

ARGENTINE (Fr. *argentin*, silvery, from Lat. *argentum*, silver). A small deep-sea smelt, most abundant on the southern coasts of Europe, where it is seined in schools, with anchovies and sardines. These fishes are chiefly remarkable and valuable for the resplendent silvery lustre of their sides and the abundance of nacre, the substance used in making artificial pearls, with which their air-bladder is externally loaded. It consists of a coat of silvery fibres. Representatives of the genus (Argentina) are found on both shores of America. See Plate of WHITEFISH,. SMELT, etc.

ARGENTITE, or SILVER GLANCE. A gray sulphide of silver occurring massive or in isometric crystals. It is a rich ore of silver.

AR′GENTORA′TUM. The Latin name for Strassburg, derived from an old Celtic term signifying "the Stone of Argantos."

ARGHOOL, är-gōōl′. A wood wind-instrument of the Arabs, invented in post-Mohammedan times. It consists of two tubes, made of common cane, with a reed mouthpiece. One tube is always, the other usually, perforated.

ARGILE PLASTIQUE, ăr′zhêl′ plȧ′stēk′ (Fr., plastic clay). A series of beds at the base of the Tertiary system in France, which consist of extensive deposits of sand, with occasional beds of plastic clays, used for pottery. See TERTIARY SYSTEM.

AR′GILLA′CEOUS ROCKS (Lat. *argillaceus*, clayey, from *argilla*, Gk. ἄργιλλος, *argillos*, white clay, potter's earth; cf. ἀργός, *argos*, shining, white). Rocks consisting of or containing more or less clay. Pure clay, or kaolinite, a hydrated silicate of aluminum, is always an alteration product of other minerals, particularly of feldspars. However, the term 'clay' is applied to practically all plastic or sticky masses of earth or shale, which may include, besides kaolinite, a variety of minerals, such as quartz, feldspar, limonite, hematite, magnetite, etc. Clay deposits may be either residual or transported—i.e., formed in place, or carried to the point of deposition by water, wind, or glaciers. They are derived from the alteration of igneous rocks, limestone, sandstone, or shale. When consolidated without deformation, so that they have partings or capacity to part along planes of deposition, clay deposits form shale. When consolidated and so metamorphosed that new planes of cleavage are developed at angles to the deposition planes, the clay is known as a slate or clay-slate. When still more metamorphosed, the clay may be known as a phyllite. Argillaceous rocks may be readily identified by the peculiar odor which they emit when breathed upon. These rocks grade by admixture of lime into calcareous rocks or limestones. See ARENACEOUS ROCKS; ROCKS; GEOLOGY; CLAY.

AR′GILLITE. See SHALE.

AR′GINU′SÆ. Three islets off the south coast of the island of Mytilene (Lesbos), Asiatic Turkey. Near their shores the Spartan fleet under Callicratides was defeated by the Athenian fleet under Conon, September, B.C. 406.

AR′GIVES, or ARGIVI (Lat. *Argivi*, Gk. Ἀργεῖοι, *Argeioi*). (See ARGOLIS.) The inhabitants of Argos. In Homer, the name is applied to all the Greeks.

AR′GO. See ARGONAUTS.

ARGO. A large southern constellation in which is commemorated the mythical ship of the expedition of the Argonauts (q.v.). Canopus, a star of the first magnitude, is its chief ornament. Its declination (52° 38′ S.) renders it invisible in the northern and central United States. Eta Argus, a star in this constellation, has undergone greater changes in brightness than any other variable star of its class. It is situated in a remarkable nebula, named by Sir John Herschel the "keyhole" nebula, on account of its shape. Very recent photographic observations at the Cape of Good Hope Observatory leave little room to doubt the existence of some connection between Eta Argus and the nebula.

AR′GOB. A district in Bashan, which, according to Deut. iii. 4 contained threescore walled cities, "the kingdom of Og." Its exact location is uncertain. The Targums translate Argob by Trakona—i.e., Trachonitis, the modern El Leja—which, indeed, abounds in deserted towns and villages. Some of these are cave dwellings or subterranean chambers; others are built above ground, of massive blocks of black basalt, with heavy doors moving on pivots, staircases and roofs of the same material. The latter belong to the period from the First to the Seventh Century A.D., according to De Vogüé, Barton and Drake, Wetzstein and Waddington; though it is possible that the Greek cities may have been built on the sites of earlier towns, as Driver suggests. In Deut. iii. 14, Jair, son of Manasseh, is said to have conquered the region of Argob as far as Geshur and Maacha. But the Hawoth Jair were tent-villages in Gilead, not walled cities in Bashan. Argob may have been situated on the western slopes of Jebel Hauran, north of Salchil, but this is far from certain. A most careful description of the region is given by J. G. Wetzstein, *Reisebericht über Hauran und die Trachonen* (Berlin, 1860); cf. also the excellent plates in De Vogüé's *Syrie Centrale* (Paris, 1869). Porter, *Five Years in Damascus* (London, 1870), and *Giant Cities of Bashan* (London, 1869), are interesting but somewhat unreliable.

AR′GOL (of uncertain origin, perhaps from Gk. ἀργός, *argos*, white). The crude potassium bi-tartrate which is found as a crust in wine vats. It exists originally in the juice of the grape, but is deposited during fermentation, as it is sparingly soluble in an alcoholic liquid. Accordingly as it is deposited from the red or white grape, it is called *red argol* or *white argol*. In addition to the potassium bi-tartrate it usually contains small quantities of calcium tartrate with coloring and extractive matters. Crude argol is purified by dissolving in water and heating for several days; on cooling, the clear liquor is run off, the deposited crystals constituting the commercial cream of tartar.

AR′GOLIS (Gk. Ἀργολίς). A division of ancient Greece. In its wider sense it is the northeast portion of the Peloponnesus, bounded on the west by Achæa, Arcadia, and Laconia; on the north bordering on the Corinthian and Saronic Gulfs; and penetrated on the south by the Argolic Gulf, which separates the portion bordering on Laconia, the Kynuria, from the eastern peninsula. This district, containing about 1700 square miles, is filled with mountains, and never in historical times formed one kingdom; and the northern states—Sicyon, Corinth, and Phlius—were often considered outside of Argolis proper. The chief towns of the eastern peninsula were Epidaurus, Trœzen, and Hermione. The plain of Argos, in the middle portion, was famed for its fertility, and contained the cities of Mycenæ, Tiryns, and Argos, and was called Argeia. The edge of this plain is now swampy; and the southeast portion contained, even in ancient times, the swamp of Lerna, home of the Hydra (q.v.), slain by Hercules. In the legends Argolis plays an important part. Mycenæ is the home of Agamemnon and the capital, though other chiefs rule at Argos, Midea, and Tiryns. Here, also, was placed the birth of Hercules, and his contests with the Nemean lion and the Lernean hydra. Still earlier, the plain was the scene of the story of Inachus and his daughter, Io, of Danaus and his daughters, and of the rule of Perseus and Pelops.

In historic times the chief city was Argos, which held possession of the Argive plain, and was at the head of a somewhat loosely organized league of several of the Argolic States, which under King Pheidon (c.670 B.C.) became a great power in the Peloponnesus. Later the growing power of Sparta greatly lessened the influence of Argos, which, however, always remained a jealous rival, and during the Fifth and Fourth centuries B.C. usually appears in alliance with Athens.

The principal divinity of Argos was Hera, who had a very ancient sanctuary to the east of the city, the Heræum, where was a celebrated gold and ivory statue of the goddess, the work of Polycletus. This sanctuary was excavated by the American School of Classical Studies at Athens, from 1892 to 1895, resulting in the discovery of a large number of buildings, including the earlier and later temples, much interesting sculpture, and a great mass of pottery, showing that this had been a place of worship from the earliest times. Argos was the seat of a celebrated school of artists in bronze, and was also famed for its musicians. The modern town is a flourishing place on the site of the ancient city, of which few traces remain in sight. Argolis is one of the nomes of the kingdom of Greece. The capital is Nauplia.

AR'GON (Gk. *ἀργόν*, neut. of *ἀργός*, *argos*, inactive, inert, alluding to its incapacity for entering into chemical combination). A gaseous element discovered in 1895 by Lord Rayleigh and William Ramsay, although Cavendish had already mentioned it as a constituent of atmospheric air a century ago. Argon is contained in the atmosphere to the extent of nearly 1 per cent. It was obtained by its discoverers by passing air through a combustion tube packed with metallic copper, which absorbed the oxygen, after which the gas was passed through an iron tube packed with magnesium turnings and heated in a combustion furnace. The magnesium absorbed the nitrogen, and the argon, in its gaseous form, was then collected in a holder. It was also obtained by adding oxygen to air, subjecting the mixture to the action of an electric current in the presence of an alkali, and removing all oxygen by means of pyrogallic acid. The density of the argon made by means of magnesium was 19.94; that of argon prepared by the second method was 20.6 (the density of hydrogen being taken as unit, or rather that of oxygen as 16). The elementary nature of argon has been demonstrated by a comparison of its specific heats at constant pressure and at constant volume, which showed that a molecule of argon is made up by a single atom and hence is not compound. But if this is true, then the molecular weight (i.e. twice the density) of argon is identical with its atomic weight, and hence the latter is concluded to be about 40. Sir William Crookes found in the spectrum of argon two characteristic lines near the red end that could not be mistaken for the lines of nitrogen or of any other element. Argon cannot be liquefied unless its temperature is reduced at least 121 degrees below zero C. At —121° C. a pressure of 50.6 atmospheres (759 pounds per square inch) is sufficient to produce liquefaction. Under ordinary atmospheric pressure, liquid argon boils at —187° C. At the temperature of —190° C. it freezes. No well-defined chemical compound of argon with other substances is as yet known. Its discoverers received the first Hodgkins Medal and the grand prize of the Smithsonian Institution at Washington. Consult: Lord Rayleigh and W. Ramsay, *Argon, a New Constituent of the Atmosphere*, Smithsonian Contributions to Knowledge (Washington, 1896).

AR'GONAUT. A small pelagic octopod cuttlefish of the genus Argonauta; specifically, the paper sailor or paper nautilus (*Argonauta argo*). The female is many times longer than the male, and secretes a thin, iridescent, crenelated and somewhat boat-shaped shell, which serves as a brood-pouch. In calm weather the animal rises to the surface and seems to voyage about, whence the fanciful name and sundry fables. For fuller description, see OCTOPUS.

AR'GONAU'TICA. An epic poem, narrating the deeds of the Argonauts, written by Apollonius of Rhodes.

AR'GONAUTS (Gk.’*Αργοναῦται*, *Argonautai*—i.e. "the sailors on the ship *Argo*"). A name given to those who, under command of Jason, undertook a voyage famous in Greek legend. The *Argo* is mentioned in the *Odyssey*, and incidents of the story appear in the Hesiodic poems. Allusions, often contradictory and influenced by local legends, are scattered through the fragments of lyric poetry, and single episodes were used by the tragedians, though only the Medea of Euripides has survived. These fragments, and the somewhat more satisfactory scraps from the prose writers, are the chief sources for the earlier versions; but our most complete and valuable account is contained in the poem, in four books, by the Alexandrian librarian, Apollonius Rhodius, who tried to combine the mass of material with which his studies had made him familiar into a connected and consistent narrative. A brief narrative is also found in the mythological handbook which goes under the name of *Apollodorus*. In its main outlines the story is as follows: Pelias, King of Iolcus, in Thessaly, having reason to fear his nephew, Jason, commanded him to fetch from King Æetes, in Colchis, the golden fleece of the ram which had borne away Phrixus and Helle (q.v.). With the help of Hera and Athena, Jason and Argos, son of Phrixus, built a wonderful ship, strong and swift, but light, and with a piece of the oracular oak from Dodona in her keel, capable of delivering prophecies. About him Jason gathered a band of heroes, whose names and number vary greatly, though the party is usually estimated to have comprised about fifty. The earlier versions seem to have placed the land of Æetes in the far east, but the later writers placed it in Colchis, on the Black Sea. On the voyage the most notable adventures were: (1) The landing on Lemnos, where the Argonauts found a State of women, under Queen Hypsipyle, all the men having been murdered shortly before. Here they remained some time, and two sons were born to Jason and Hypsipyle. (2) Near the Bosporus Pollux conquered Amyeus, King of the Bebryces, in a boxing match, and so secured for his companions access to a spring. (3) In these same Thracian regions they found the blind prophet Phineus, tormented by the Harpies (q.v.), whom the sons of Boreas, Calaïs, and Zetes put to flight, and in return Phineus showed the Argonauts how to pass the ever-clashing rocks of the Symplegades. (4) This adventure they accomplished by hard rowing, after they had been encouraged by the sight of a dove, which flew through the passage with only the loss of her tail feathers. When they arrived at Colchis, Æetes demanded that Jason should yoke fire-breathing bulls with brazen hoofs, plow with them a field, sow the dragon's teeth given him by Cadmus, and then destroy the crop of giants which would spring from such seed. All this Jason accomplished, with the help of Æetes's daughter, Medea, who had fallen in love with the hero. With her help, also, he foiled further plots of the King, and securing the fleece by stealth, fled with Medea and her young brother. Pursued by Æetes, Medea saved the Argonauts from capture by killing her brother and strewing the fragments of his body into the sea, thus delaying her father, who piously collected his son's remains for burial. The return of the Argonauts was very diversely narrated. Some brought them by way of the Tanaïs into the Northern Sea, while others led them eastward to the ocean and back across Africa, carrying their ship through the Libyan desert on their shoulders. After many adventures they at length reached Iolcus, and delivered the fleece to Pelias. (For the further legends see articles Medea, Pelias.) There are indications that both Jason and Medea were originally worshiped as gods at Corinth and elsewhere, but later sank to the rank of heroes, and became connected with the common folk-tale of the lover who must perform impossible tasks to win his mistress, but who overcomes all obstacles by magic help. Whatever the origin of the story, there can be no doubt that it was developed under the influence of the voyages that marked the great period of Greek colonization in the Eighth and Seventh centuries B.C. The wonders and adventures encountered by the first explorers of the Black Sea and the west were thrown back into the mythical past, and told of gods and heroes—Hercules, Jason, and Odysseus.

ARGONAUTS OF '49. A name applied to the fortune-seekers who emigrated to California in the years immediately following the discovery of gold there in 1848, the largest number of whom went out in 1849. See Forty-Niners.

ARGONNE, är'gŭn'. A rocky plateau in northeast France, extending along the border of Lorraine and Champagne, and forming parts of the departments of Ardennes and Meuse. The Argonne forest proper, or western Argonne, has a length of over thirty miles and a width of from one to eight miles. The forest of eastern Argonne includes the forest of Apremont. Argonne has been the scene of several stirring historical events, notably in connection with Dumouriez's "Argonne campaign" of 1792, and with the Franco-Prussian War.

AR'GOS. See Argolis.

ARGOSTOLI, är'gŏs-tō'lē. An episcopal city, capital of the island of Cephalonia, on the east shore of Argostoli Bay, an inlet of Livada Bay (Map: Greece, B 3). The town is famous for its mills, which are driven by a current of sea-water, flowing through an artificial channel about 150 feet long, then disappearing through fissures in the rocks. It has an excellent harbor. It finds considerable trade in exporting wine, oil, and currants. A long bridge connects the north shore of the bay with the Koutavós Lagoon, which lies to the south. Population, in 1896, 9241.

ARGOT, är'gō'. The French term for what in English is called "slang," especially the dialect of thieves and vagabonds. Like all such dialects, argot is often sparkling with wit and remarkable for aptness and comprehensiveness of expression. Many specimens of it are to be found in Victor Hugo's *Les Misérables*, in Zola's *Assommoir*, and in the lower grade of Parisian journals. Consult: Barrère, *Argot and Slang* (London, 1887), and see the article Slang, in this Encyclopædia.

ARGOUT, är'gōō', Antoine Maurice Apollinaire, Count d' (1782-1858). A French financier. He was born in Isère, and after acting as auditor to the Council of State (1810), became prefect of Gard (1817), and a peer of France (1819). As mediator between Charles X. and the popular leaders, during July, 1830, he obtained concessions from Charles, but not until it was too late. He was appointed minister of the marine in 1830, and acted as minister of commerce (1831), and minister of the interior (1833). He was governor of the Bank of France from 1834 until his death, except for a short while in 1836 when he was minister of finance. In 1852 he entered the Senate.

ARGUELLES, är'gā'lyâs, Agustín (1776-1844). A Spanish politician of the liberal school. He was born at Rivadisella, in Asturias. On the breaking out of the War of Independence in 1808, he went to Cadiz, where he agitated for the organization of a regency with a free constitution. In 1812 he was sent as representative of his native province to the Cortes, where he was appointed one of the members of a committee to draft a constitution. His splendid talents as a public speaker soon won him the admiration of the Liberal party, who used to call him the Spanish Cicero. But on the return of Ferdinand VII., Arguelles fell a victim to the reactionary spirit which ensued. On May 10, 1814, he was arrested, and after a trial that was a mockery of justice, condemned by the King to ten years' imprisonment in the galleys at Ceuta. The revolution of 1820 restored him to freedom. Arguelles became minister of the interior, but soon resigned, provoked beyond measure by the narrow bigotry of the court. He continued a constitutional Liberal always. In the Cortes held at Seville, in 1823, he voted for the suspension of the royal power; but after the violation of the constitution he fled to England, where he remained till the amnesty of 1832. On his return to Spain he was repeatedly made president and vice-president of the Chamber of Deputies, and always showed himself a moderate but unwavering reformer. In July, 1841, in the discussion of the law regarding the sale of Church property, he delivered himself strongly against all concordats with the Pope. Next to Espartero, he was the most popular man in the kingdom with the enlightened party. During the regency of Espartero he was guardian to the young Queen Isabella. In his old age he still exhibited the fiery eloquence that marked his youth. Consult: Evaristo San Miguel, *Vida de D. A. Arguelles* (Madrid, 1851).

AR′GUMENT. In law, the address by counsel to the court or jury, in which he argues upon the merits of his client's case in order to affect the decision or verdict to be rendered. Arguments to the jury are based upon the facts established or disputed in evidence at the trial of a cause, and upon matter of common knowledge of which the court may take judicial cognizance. Arguments addressed to the court may be based either upon the facts before it or upon the law. The time to be devoted to the argument, its scope, and order, are subject to the discretionary control of the court. It is the usual practice to permit the attorney for a plaintiff or appellant both to open and close the argument. If in the argument the attorney goes beyond proper comment upon the evidence, or indulges in abuse of a party or attorney in the case, or comments upon failure of a privileged witness to testify, or otherwise so conducts himself as to unwarrantably inflame or prejudice the minds of the jury, it may be ground for setting aside the verdict. See JURY and the authorities referred to under PRACTICE.

ARGUMENT (Lat. *argumentum*). In logic, either the ground or premise on which a conclusion is rested, and, more specifically, the minor premise (see LOGIC), or a whole syllogism. Popularly, it is applied to a series of arguments, or to a controversy. *Argumentum ad hominem* is an appeal to the known prepossessions or admissions of the persons addressed. For instance, an attempt may be made to silence an opponent, who has recently changed his mind, by saying: "Your well-known speech last winter leaves you the single course open of admitting that so-and-so is the case." *Argumentum ad rem* is an argument pertinent to the issue. *Argumentum e consensu gentium*, or *ad judicium*, is an appeal to the common belief of mankind. The *Argumentum a tuto* rests upon the supposed safety or prudence of adopting a certain conclusion. *Argumentum ad populum* is an appeal to popular passions or prejudices. *Argumentum ad ignorantiam* is an artful attempt to establish a statement by showing that we do not know the truth of its opposite. *Argumentum ad verecundiam* is an appeal to a revered authority. Lastly, the *argumentum a baculo* is the use of the cudgel or of a browbeating manner to settle a dispute. This form of argument is concise in its style, and has quickly adjusted many controversies.

ARGUN, är-go͞on′. A river of Asia, which unites with the Shilka at Ust-Strielka, on the borders of Siberia and Manchuria, to form the Amur. It rises on the northern borders of Mongolia, and has a generally easterly course of about 1100 miles, in the lower half of which it forms the boundary between Trans-Baikalia and Manchuria. Not far from the middle point of its course it flows through a considerable lake called Dalai-Nor. In its upper course it bears the name of Kerulen.

ARGUN KHAN, är-gŏŏn′ kän. See MONGOL DYNASTIES.

AR′GUS (Lat. for Gk. Ἄργος, *Argos*). (1) The son of Zeus and Niobe. He was the mythical ancestor of the Argives, and founder of Argos, and was worshiped at his grave, near that city. He was said to have introduced agriculture from Libya. (2) Argus, surnamed Panoptes (all-seeing), had 100 eyes, some of which were always awake. For his watchfulness Hera chose him to guard Io (q.v.), who had been transformed into a cow. Hermes, sent by Zeus to steal the cow, killed Argus by stoning him, or, in the later version, charmed all his eyes to sleep and struck off his head. Hera used the eyes of Argus to decorate the peacock's tail. (3) Argus, the builder of the ship Argo. (See ARGONAUTS.) (4) Argus (Argos) is also the name of several Greek cities, of which the most celebrated was the historic capital of the Argolic plain. In Homer, Argos denoted the kingdom of Agamemnon, the entire Peloponnesus, and even the whole of Greece. (5) Argus, the dog of Odysseus, who, after twenty years, recognized his master on his return in spite of his disguise, and died of joy.

ARGUS, THE. See ALLEN, WILLIAM HENRY.

ARGUS PHEASANT. See PHEASANT.

ARGYLL, är-gīl′, ARCHIBALD CAMPBELL, Marquis of (1598-1661). A Scotch political character of the Seventeenth Century. In his sixteenth year he saw service under his father, whom he succeeded, as eighth earl, in 1638. Already he had given proofs of that strength of religious principle which marked his whole life and of a perilous union of attachment to Charles I., and of faith in the principles against which the King made war. In the General Assembly at Glasgow, in November, 1638, he openly took the side of the Covenanters, and thenceforth became recognized as their political head. In 1640 he commanded a military expedition through Badenoch, Athole, Mar, and Angus, for the purpose of enforcing subjection to the Scottish Parliament. The King, on his visit to Scotland in 1641, found it convenient to show peculiar favor to Argyll, and created him a marquis. On the breaking out of hostilities, Argyll was still desirous for negotiation, but was finally compelled to take the field. In April, 1644, he dispersed the Royalist forces under the Marquis of Huntly in Aberdeenshire. He was less successful in withstanding the genius of Montrose, who, on February 2, 1645, almost annihilated his army at Inverlochy. His estates had suffered so much in the preceding year from the ravages of the brilliant Cavalier that a sum of public money was voted for his support. In August, 1646, he went to London, with Loudon and Dunfermline, to treat with the Parliament for a mitigation of the articles presented to the King. He was at the same time the bearer of a secret commission from the King to treat with the Duke of Richmond and the Marquis of Hertford, on the propriety of a Scottish demonstration in favor of Charles. On the defeat of the "engagement" plan, to which he had been decidedly opposed, the government of Scotland devolved on Argyll and the other Presbyterian leaders. In the Parliament of February, 1649, Charles II. was proclaimed king, and at Scone, on January 1, 1651, Argyll put the crown on his head. At this time, it was even said that the complaisant monarch intended to marry one of his daughters. As head of the committee of estates, Argyll took vigorous measures to oppose Cromwell's invasion of Scotland, and still adhered to the King, after the subjugation of the country. After the battle of Worcester, he retired to Inverary, where he held out for a year against Cromwell's troops. Falling ill, he was taken prisoner by General Dean. He refused submission to the Protector, but made an engagement to live peaceably, which he strictly kept. On the Restoration, he repaired to Whitehall, encouraged by a flattering letter from the King to his son. Impeached with the crime of having submitted to the usurper (to whom he had refused allegiance), he was committed to the Tower, and on February 13, 1661, was brought before the Scottish Parliament on the charge of treason. He defended himself with spirit, but in vain. On the 27th of May, he was executed at Edinburgh—having displayed throughout his whole trial, and on the scaffold, the dignity of a true nobleman, and the meekness of a Christian. Conflicting estimates of Argyll's character have been written; cowardice in the field has been proved against him, and Scott places him in an unfavorable light in his *Legend of Montrose*.

ARGYLL, Archibald Campbell, ninth Earl of (?-1685). Eldest son of the preceding. He was early distinguished by personal accomplishments, and exhibited great bravery on the disastrous day of Dunbar, where he commanded a regiment on the Royalist side. After Worcester, he continued, like his father, in arms, and made himself so obnoxious to the Parliamentary leaders that he was specially excepted by Cromwell from the Act of Grace in 1654. After much harassing persecution, he submitted to the Parliament, but continued to be closely watched. On the restoration of Charles II., he was received into high favor (as a balance to the execution of his father), and, unfortunately for his own fame, participated in some of the iniquitous acts of the Scottish Legislature. He had, however, numerous and active enemies; and, on the ground of an intercepted letter, in which he had complained of neglect, he was tried and condemned to death by the Scottish Parliament for the imaginary crime of *læsa majestas*. The influence of Clarendon restored him to liberty and favor; even the King himself was prejudiced in his favor, but in taking the test oath framed by the Scottish Parliament in 1681, his added reservation, "So far as consistent with the Protestant faith," was declared treasonable, and he was again condemned to death. The devotion of his wife enabled him to escape from Edinburgh Castle in the disguise of a page, and, after remaining concealed some time, he fled to Holland. On the accession of James II., he landed in the north of Scotland, in May, 1685, with an armed force, to coöperate in the revolt of Monmouth, but after a series of misfortunes, was taken prisoner, hastily condemned, and beheaded, June 30, 1685. His son Archibald, one of the deputation sent by the Scottish Convention to present the crown to the Prince of Orange, was in 1701 created Duke of Argyll.

ARGYLL, är-gīl′, George John Douglas Campbell, eighth Duke of (1823-1900). He succeeded his father in 1847. At the age of nineteen, while Marquis of Lorne, he wrote a pamphlet entitled *A Letter to the Peers from a Peer's Son*, on the struggle which ended in the disruption of the Scottish Church. In 1848 he published an essay on presbytery, which contains a historical vindication of the Presbyterian system. On the formation of the coalition ministry by Lord Aberdeen he was invested with the office of Lord Privy Seal, which he continued to hold in Lord Palmerston's administration. In 1855 he relinquished his office and became Postmaster-General. In 1859, on Palmerston's return, he again accepted office. He was secretary of state for India under Mr. Gladstone in 1868-74, and Lord Privy Seal in 1880-81; he resigned office in 1881, disapproving of the Irish Land Bill. In 1874 he had supported the abolition of patronage in the Church of Scotland. In 1854 he was chosen Lord Rector of the University of Glasgow; in 1855 presided at a meeting of the British Association in that city, and in 1861 was elected president of the Royal Society of Edinburgh. He was hereditary master of the Queen's household in Scotland, Chancellor of the University of Saint Andrews, a trustee of the British Museum, also hereditary sheriff and lord-lieutenant of Argyllshire. Besides numerous papers on zoölogy, geology, etc., he wrote *The Reign of Law* (1866); *Primeval Man* (1869); *A History of the Antiquities of Iona* (1871); *The Unity of Nature* (1884); a volume of poems, *The Burdens of Belief* (1894); and *Organic Evolution* (1898). Though Argyll is best known by *The Reign of Law*, which has become a classic in the defense of theism, all his work shows very great ability. He was also one of the most finished orators of his time.

ARGYLL, John Douglas Sutherland Campbell, ninth Duke of (1845—). An English statesman and author. He was born in London, and was educated at Eton, Saint Andrews University, and Trinity College, Cambridge. He was returned to Parliament as a Liberal from Argyllshire, which he represented from 1868 to 1878. In 1871 he married Louise, fourth daughter of Queen Victoria. From 1878-83, as Marquis of Lorne, he was Governor-General of Canada, his administration being markedly popular and successful. In 1895 he was returned to Parliament from South Manchester. He succeeded to the dukedom of Argyll in 1900. He has published *A Trip to the Tropics* (1867); *Guido and Lita* (1875); *The Psalms Literally Rendered in Verse* (1877); *Imperial Federation* (1885); and *Canadian Pictures* (1885); and he also prepared the official Life of Queen Victoria, which appeared in 1901.

ARGYLL, John Campbell, second Duke of (1678-1743). A Scotch general and statesman. He was the son of the first duke, and took an important part in the political and military affairs of his time. As royal commissioner in 1705, he had a principal share in bringing about the union of England and Scotland. As a soldier he distinguished himself under Marlborough at Ramillies, Oudenarde, Lille, Ghent, and Malplaquet. Previous to the change of ministry in 1710, Argyll had been a strong Whig. He now joined the Tories in opposing the Duke of Marlborough. As a reward he was appointed by the Tories generalissimo of the British army in Spain; but, considering himself to have been slighted by the ministry, he soon after returned, and finding his influence greatly diminished, he again became a Whig. His career up to the rebellion of 1715 was tortuous, and seriously detracts from his meritorious services during that critical period. He was, however, placed in command of the King's forces in Scotland, and was completely successful in quelling the Jacobite rising. His services were rewarded in 1718 with an English peerage, and the title of Duke of Greenwich. In 1721 he again played into the hands of the Tories, for the purpose of securing the entire patronage of Scotland. In 1737 he rose into immense popularity in his own country by his spirited defense before Parliament of the city of Edinburgh in regard to the Porteous mob. Pride and passion rather than ambition were the motives which chiefly controlled him. He was endowed with remarkable oratorical gifts, but the shiftiness of his policy prevented him from ever attaining a place commensurate with his seeming abilities. He was noted for his kindness and courtesy in private life. The benevolence of his disposition procured him the title of "the Good Duke of Argyll." See the flattering description of him in Scott's *Heart of Midlothian*. See also his *Life*, by Robert Campbell (1745).

ARGYLL AND THE ISLES, JAMES ROBERT ALEXANDER CHINNERY-HALDANE, Lord Bishop of (1842—). A Scottish prelate. He was educated at Trinity College, Cambridge, took orders in 1866, and was curate of All Saints, Edinburgh, from 1869 to 1876. From 1876 to 1895 he was rector of Nether Lochaber, and in 1881-83 was Dean of Argyll and the Isles. In 1883 he became bishop. Among his publications may be mentioned *The Scottish Communicant* and *The Communicant's Guide*.

ARGYLL'SHIRE (*Argyle*, Gael. *Airer-Gaedhel*, district of the Gaels). A county in the west midland division of Scotland, bounded west and south by the sea (Map: Scotland, C 3). Its greatest length is about 115 miles; greatest breadth, about 55 miles; its extent of coast line is very great, amounting to 2289 miles, owing to the indentation of the coast by the numerous lochs running inland. Next to Inverness, it is the largest county in Scotland; area, 3232 square miles, of which 616 are occupied by numerous islands. The county is divided into the districts of Cantire, North and South Argyll, Lorn, Appin, Cowal, Morven, and Sunart. The chief islands are Mull, Islay, Jura, Tiree, Coll, Lismore, and Colonsay, with Iona and Staffa. The general aspect is wild and picturesque, marked by rugged and lofty mountains and deep inland bays. Some fertile valleys exist. Sheep and cattle rearing are the chief industries. More sheep are reared in Argyll than in any other Scotch county, and nearly 1,000,000 acres are in permanent pasture. Argyll abounds in deer and other game. Loch Awe abounds in salmon and trout. There are also some mineral industries. The chief towns and villages are Inverary, the capital, Campbelton, Oban, Dunoon, Appin, Lochgilphead, and Tarbert. Population, in 1801, 81,300; in 1851, 89,300; in 1891, 75,000; in 1901, 73,700, the decrease being chiefly due to emigration. Consult Campbell, *Records of Argyll* (Edinburgh, 1885).

ARGYRO-CASTRO. A town of European Turkey, in the vilayet of Janinà, on an affluent of the Viosa River, 90 miles southwest of Monastir. It has several mosques. Population, about 20,000.

ARGYROPULOS, är'gē-rō-po͞o'lŏs, JOHANNES (1416-73). A Greek humanist, who contributed largely to the revival of Greek learning in the West. He was born at Constantinople, but went to Italy at an early age, and in 1456 was called by Cosmo de Medici to the chair of Greek and the Aristotelian philosophy at Florence. There his pupils included Lorenzo and Pietro de' Medici, Politianus, Reuchlin, and Acciaioli. In 1471 he removed to Rome, where he died. His chief works were Latin texts of Aristotle, and a commentary on the *Ethics* of that philosopher.

ARIA, ä'rē-ȧ *or* ā'rĭ-a, or **AIR** (It., from Lat. *aer*, Engl. *air*, in the meaning style, manner; for similar development of meaning, cf. *modus*, mode, musical mode). In music, a rhythmic song or melody as distinguished from recitative (q.v.). At one time the term was applied to a broad, flowing melody or set number in any music—even instrumental music, as e.g. Bach's *Aria* for the violin. At present it almost exclusively denotes a lyrical piece for one voice, with instrumental accompaniment. It is sung either by itself, when it bears the name of *concert aria*, or in an opera, cantata, or oratorio. In its modern form, it represents the *grand*, or *da capo*, form invented by Alessandro Scarlatti (q.v.), and consists of three sections: (1) the general theme, the lyric outburst introduced (sometimes after an instrumental prelude—*ritornello*) and worked out in broad style; (2) a less agitated part richly harmonized and contrapuntally elaborated; (3) a repetition of the first section with various embellishments. ARIETTA (Italian, diminutive of *aria*) is a short aria. ARIOSO is a melody which follows less strictly the rigid form of the aria, and has more of the effect of recitative. ARIA BUFFA is a comic aria.

A'RIAD'NE (Gk. 'Αριάδνη). A daughter of Minos, King of Crete, by Pasiphaë. In the earliest form of the story Ariadne, while on her way to Athens with Theseus, was killed by Artemis. The more common version told how, when Theseus (q.v.) landed in Crete with the offerings for the Minotaur, Ariadne loved the youthful stranger, and enabled him to slay the monster and escape from the labyrinth. Theseus secretly carried her with him from Crete, but abandoned her on the island of Naxos. The earlier writers seem to have attributed this desertion to the will of Dionysus, while later the faithlessness of Theseus was made prominent. Dionysus found the deserted Ariadne, and made her his bride, placing her crown among the stars. Ariadne, as left forsaken by Theseus, and as found and married by Dionysus, has been a favorite subject with artists.

A'RIAL'DUS. A deacon of the Church of Milan, who flourished during the Eleventh Century, and was called the Patarene, an opprobrious epithet, meaning "the ragpicker," because his followers assembled in the slum quarter of Milan, where the ragpickers lived. He led them in vigorous protest, even insurrections, against the clerical marriages and incontinence and in support of the strict enforcement of clerical celibacy. Although successively sanctioned by Popes Stephen IX. (1057-58), Nicholas II. (1059-61), Alexander II. (1061-73), he found little sympathy among his brethren, and used to complain that he could get only laymen to assist him in his agitation. Having at length succeeded in obtaining a Papal bull of excommunication against the Archbishop of Milan (1065), a fierce tumult ensued in the city, whose inhabitants declared against Arialdus and his coadjutors, not because they opposed clerical marriages, but because they thought them bent on subjugating the Church of Milan to Rome. Arialdus now fled to the country, but his hiding-place being betrayed, he was conveyed captive to a desert isle in Lake Maggiore, where he was murdered by the emissaries of the archbishop, and his remains thrown into the lake, June 28, 1065. He was afterwards canonized by Pope Alexander II.

ARIANE, á'rê-án'. One of Corneille's less excellent tragedies, composed in his period of decline, in 1672, and founded on Ariane's (Ariadne's) adventures after her unhappy marriage with Theseus.

A'RIANISM. See ARIUS.

ARIANO, ä'rê-ä'nô (anciently, Lat. *Arianum*). An episcopal city of southern Italy, 3400 feet above the sea, 84 miles northeast of Naples (Map: Italy, K 6). In the limestone of the surrounding mountains, caves have been hollowed out, in which many of the poorer people dwell. The chief manufacture is earthenware. Population, in 1881, 14,398; in 1901 (commune), 17,650.

A'RIANS. See ARIUS; HERESY; HERETICS.

ARIAS, ä'rĭ-*as*, BENEDICTUS, surnamed MONTANUS (1527-98). A Roman Catholic divine noted for his great linguistic attainments. He was born at Fregenal de la Sierra, Spain. He studied first at Seville, and afterwards at Alcalá de Henares, where he distinguished himself by the ardor he manifested in the acquisition of the Oriental languages, Arabic, Syriac, and Chaldee. He next proceeded on a tour through Italy, France, Germany, England, and the Netherlands, in the course of which he obtained a knowledge of various modern tongues. He joined the knightly Order of Saint James as a priest, and as theologue of Bishop Martin Perez Azala, of Segovia, attended the Council of Trent; but on his return home he resolved to retire into seclusion at Aracena, and dedicate his whole time to literature. In 1568, however, Philip II. persuaded him to repair to Antwerp and superintend the publication of the famous edition of the Polyglot Bible, executed in that city at the suggestion of the printer, Christopher Plantin. After four years' labor, the work was issued under the title *Biblia Sacra, Hebraice, Chaldaice, Græce et Latine, Philippi II. Regis Catholici Pietate et Studio ad Sacrisanctæ Ecclesiæ Usum Chph. Plantinus excudebat* (Antwerp, 1569-73, 8 vols., folio). Only 500 sets were printed, and the greater part of them were lost at sea, on their way to Spain. It was received with universal applause. The Jesuits, to whom Arias was sincerely and strenuously opposed, alone attempted to fasten the charge of heresy on the author because he had included so much rabbinical matter, and he made several journeys to Rome to clear himself of the accusation. Philip II. rewarded him with a pension of 2000 ducats, besides bestowing on him various other emoluments—as court chaplain and librarian at the Escurial. He died at Seville in 1598. His literary works are very numerous. They relate principally to the Bible and to Jewish antiquities; but he also wrote numerous Latin poems and a history of nature. For his biography and portrait consult: *Memorias de la real Academia de la Historia*, Vol. VII. (Madrid, 1832).

ARICA, á-rē'ká. A seaport town of northern Chile, situated in the Province of Tacna, about 40 miles by rail from Tacna, the capital of the province (Map: South America, Peru, C 7). It has a safe roadstead, and is of importance to Bolivia owing to its connection by road with La Paz. It has a considerable export trade, the chief products being copper, silver, alpaca, wool, and guano. The population, estimated at the time of the Spanish régime at 30,000, was at the census of 1903 only 2877. Arica was founded over two hundred years ago and has suffered considerably from earthquakes, that of 1868 being most destructive. During the war between Chile and Peru, the town was bombarded by the Chilean forces and was transferred to Chile in 1883 along with the Province of Tacna (q.v.).

ARICHAT, ä'rê-shät'. A seaport on Madame Island, Nova Scotia, the capital of Richmond County. The town is the see of a Roman Catholic episcopate, and with West Arichat numbers about 2500 inhabitants, mostly engaged in fishing. Its harbor accommodates the largest vessels. The United States is represented by a consular agent.

ARICI, á-rē'chê, CESARE (1782-1836). An Italian poet, born at Bresci. He studied at Milan, and was secretary of the departmental court at Brescia under Bonaparte. He was appointed professor of eloquence in the lyceum at Brescia in 1810, subsequently professor of history and literature, and in 1824 professor of the Latin language. His principal work is the didactic poem *La coltivazione degli olivi* (1808), which won for him an important place in Italian literature. He also wrote another didactic poem, *La pastorizia* (1814), and some shorter poems, such as *Il campo santo di Brescia*, and made a translation of the *Bucolics* and *Æneid* of Vergil.

AR'ID RE'GIONS. See DESERTS.

ARIÈGE, á'rê-âzh'. A department of France lying along the northern slopes of the Pyrenees (Map: France, H 9). Area, 1893 square miles. Population in 1896, 219,641; in 1901, 210,527. The chief industries are agriculture, iron mining, and the manufacture of woolens, linens, and pottery. Capital, Foix. Consult H. L. Duclos, *Histoire des Ariégeois*, 7 vols. (Paris, 1881-87).

ARIÈGE (anciently, Lat. *Aurigera*, gold-bearing). A tributary of the Garonne (q.v.) which rises in the Pyrenees, in southern France, and flows northward to join the Garonne above Toulouse. It is 95 miles long, and of little commercial importance.

A′RIEL. (1) An Arabian antelope. See GAZELLE. (2) A toucan. See TOUCAN.

ARIEL. The name given in the Revised Version of the Bible to (1) the father of two Moabitish youths slain by Benaiah, one of David's "mighty men" (2 Sam. xxiii. 20). (2) one of a delegation sent by Ezra (Ezra viii. 16). (3) Jerusalem (Isa. xxix. 1, 2, 7). In later Jewish angelology it was the name of a water spirit.

ARIEL. A guardian of the waters in mediæval black art, several times introduced into English poetry. The character first appears in Shakespeare's *Tempest*, where he is described as an "ayrie sprite," Prospero's servant. In Milton's *Paradise Lost* he assumes the more grandiose proportions of a fallen angel. In Pope's *Rape of the Lock* he is a minute and invisible guardian of Belinda's head-dress.

ARIES, ā′rī-ēz. See BATTERING RAM.

ARIES (Lat., the Ram). One of the signs of the zodiac, including the first 30 degrees of the ecliptic measured from the vernal equinox, or that point where the vernal passage of the sun across the equator takes place. The vernal equinox, or, as it is also called, the first point of Aries, is constantly changing its position among the fixed stars, in consequence of the precession of the equinoxes, moving westward at the rate of 50″.2 annually. It is from this circumstance that the sign Aries no longer corresponds with the constellation Aries, or the Ram, which was the case about 2000 years ago, when the ecliptic was divided into 12 equal parts called signs, each named after the group of stars through which it passed. The present sign Aries is in the constellation Pisces, about 30° west of the original sign; and although the sun when passing the vernal equinox will always be at the first point of the sign Aries, yet nearly 24,000 years will elapse before that point will again coincide with the beginning of the constellation Aries. See ECLIPTIC; PRECESSION; ZODIAC.

ARIKARA, ȧ-rē′kȧ-rȧ. A tribe of Caddoan stock now confederated with the Mandans and Grosventres on the Fort Berthold Reservation, in North Dakota, and numbering about 400. They are a northern offshoot from the Pawnee (q.v.), of whose language their own is practically a dialect. About the year 1780 they occupied several villages some 500 miles lower down the Missouri River, but were driven out by the Sioux, since which time they have rapidly declined. Their tribal name, often abbreviated to Ree, seems to be from the same root as *Pawnee.* See Dorsey, *Traditions of the Arikara* (Washington, 1904).

AR′IL (Low Lat. nom. pl. *arilli*, dry grapes; from Lat. *aridus*, dry). An extra investment of the seed, outside the ordinary testa. It may be a more or less complete investment, and is often fleshy. For example, the aril of the yew (*Taxus*) is a beautiful, scarlet, fleshy cup, which gives the seed the appearance of a berry. See SEED.

AR′IMATHÆ′A (Gk. Ἀριμαθαία, *Arimathaia*). The home of Joseph, the Jewish counselor who favored Jesus (see Matt. xxvii. 57, etc.). Its situation is not certainly known, but was probably the same as that of Ramathaim Zophim (I. Sam. i. 1), the modern Beit-Rima, about 19 miles northwest of Jerusalem.

AR′INO′RI MO′RI. See MORI, ARINORI.

ARIOCH, ā′rī-ŏk. King of Ellasar, according to Gen. xiv. He may be identical with Eri-Aku, King of Larsa, a son of Kudur Mabug, King of Elam at the time of Hammurabi (c.2200 B.C.), although it is not certain that the moon-god was called Aku in Elam. In Dan. ii. 14 Nebuchadnezzar's captain of the guard is named Arioch, which shows that in B.C. 165 the story in Gen. xiv. was already known. Arioch is an Elamitish king in league with Nebuchadnezzar in the story of Judith (i. 6).

ARI′ON (Gk. Ἀρίων, *Ariōn*). A celebrated lute-player of Methymna, in Lesbos, who lived at the time of Periander, tyrant of Corinth. According to Herodotus, Arion, while dwelling at the court of Periander, paid a visit to Sicily and Lower Italy. When on his way back by sea, the sailors of the vessel on which he had taken passage plotted to slay him and seize his possessions. Arion begged permission to try once more his skill in music, and, having been allowed to do so, threw himself at the close of his strain into the sea. Several dolphins, charmed by the music, had assembled around the vessel, and on the back of one of these he was carried in safety to Greece. The sailors, on their return, were confronted with Arion, and paid the penalty of their intended crime. Another account makes the rescue take place while Arion was on his way from Corinth to Methymna. In the days of Herodotus and Pausanias there existed at Tænarum, where Arion landed, a bronze monument, representing Arion riding on a dolphin, which was supposed to be a thank-offering made by Arion to Poseidon. The lute and dolphin were put among the constellations. Arion was regarded as the inventor of the dithyramb. He may have given it its artistic form, but even so much is doubtful.

ARION (Gk. Ἀρείων, *Areiōn*). A marvelous horse, the offspring of Poseidon by either Demeter, Gæa, or a harpy, the mother having futilely changed herself into a mare to escape the Sea God's addresses. Driven, at different times, by Copreus, Oncus, Hercules, and Adrastus, it yet possessed astounding evidences of its divine origin. It had full power of speech, and its right feet were those of a man.

ARIOSTO, ăr-yōs′tō, LUDOVICO (1474-1533). One of the most celebrated of Italian poets, the author of the *Orlando Furioso*, and, with Boiardo and Tasso, one of the trio who showed Italy how the material of the old chivalric romances might be remodeled and endowed with classic form and epic dignity. He was born September 8, 1474, at Reggio, where his father was then military governor. Like Petrarch and Boccaccio before him, he was destined by his father for the law, but abandoned it after five years of half-hearted study. His father's early death transferred to Ariosto's shoulders the burden of a large family, with but a scanty inheritance; and in 1503 he was glad of the chance offered him to enter the service of Ippolito, the Cardinal d'Este, brother of the Duke of Ferrara. By this time he had already acquired a reputation for his verses, in both Latin and Italian; but his new position was far from favorable to poetic inspiration. The Cardinal, a rough, coarse-natured man, quite destitute of poetic feeling, kept Ariosto actively employed upon diplomatic errands to Rome or upon distant embassies, and on one occasion at least, sent him into active service against the Venetians. It was, however, during the ten years that Ariosto spent in his service that the *Orlando Furioso* was written, and it was published at Ferrara, 1516, in forty cantos. Ostensibly it was a continuation of Boiardo's *Orlando Innamorato;* practically, it was a glorification of the House of Este, having for its real hero Ruggiero, the mythical founder of that House. In payment for this rather obvious flattery, the Cardinal is said to have rewarded him with a golden chain and the query, "Where he had got that rubbish?" and the following year, having incurred his patron's displeasure by a refusal to accompany him to Hungary, Ariosto passed into the service of his brother, the Duke of Ferrara. The Duke, scarcely more munificent than the Cardinal, bestowed upon him the governorship of the wild mountain district of Garfagnana, overrun with bandits, which, with all his endeavors, he could not succeed in reducing to order. He was finally recalled by the Duke in 1525, and spent his remaining years in Ferrara, nominally in his patron's service, but in reality enjoying what he prized most highly—abundant leisure for prosecuting his studies, in the modest home which the Latin inscription over the door proudly states was bought from his own savings. This house is still carefully preserved by the authorities of Ferrara. He died in that city June 6, 1533, and was buried there in the Church of San Benedetto.

The manner in which the *Orlando Furioso* is engrafted upon Boiardo's earlier poem has been aptly compared to the connection between the *Iliad* and the *Æneid* of Vergil. Boiardo's poem was based upon the chivalric cycle which dealt with the wars between Charlemagne and the Saracens, confounded as they were with those of Charles Martel, in which Orlando, or Roland, stood forward as champion of Christendom. Orlando is Boiardo's hero, and falls in love with Angelica, a clever and beautiful Oriental princess sent by the Paynim to sow discord among the Christian knights. The story, left unfinished by Boiardo, is taken up by Ariosto, who makes Angelica fall in love with an obscure young squire, upon which Orlando becomes insane. It is difficult, however, to disentangle the central argument of this poem from the mass of extraneous episodes in which it is involved. The *Orlando Furioso* has long been numbered among the world's greatest epics, but it is utterly lacking in epic unity, and probably the nearest parallel to it which can be found is that pointed out by Richard Garnett—Ovid's *Metamorphoses*. In so far as it has a central theme at all, it is not the adventures of the knight who has given it his name, but of Ruggiero's conversion from paganism, his union with Bradamante, and the incidental exaltation of the House of Este. Ariosto also left comedies, satires, sonnets, and a number of Latin poems. There are also extensive fragments of another epic, *Rinaldo Ardito*, which are attributed to him; but it is a question whether they are not rather the work of his son Virginio.

The first edition of the *Orlando Furioso*, in its present dimensions of forty-six cantos, was published at Ferrara, in 1832. Recent editions are those edited by Gioberti (Milan, 1870) and Casella (Florence, 1877), and an *édition de luxe*, with introduction by Carducci and illustrations by Doré (Milan, 1880). The latest edition of his lesser works, *Opere minori in verso e in prosa*, is that of Polidori (2 vols., Florence, 1856). The latest and most complete biography is by A. Cappelli, in his collection of Ariosto's *Letters* (Milan, 1887). Of translations, the following into English may be mentioned: by Sir John Harrington (London, 1591); John Hoole (London, 1783); and the much more spirited version of W. Stewart Rose (London, 1823).

ARIOSTO OF THE NORTH. A title given to Sir Walter Scott, suggested by the legendary subject-matter and the romantic manner of treatment which the English and the Italian poet are alike in employing.

A'RIOVIS'TUS (OHG. *heri*, *hari*, Ger. *Heer*, army, and *furist*, Ger. *Fürst*, chief). A German chief. He was the leader of the Suevi and other German tribes, and was requested by the Sequani, a Gallic people, to assist them in a contest against the Ædui. Having gained a victory for the Sequani, Ariovistus was so well pleased with their country (now Burgundy), that he determined to abide there with his followers. Many other Germans followed him into Gaul, where he soon collected an army of 120,000 men. The Gallic people now turned for help to the Romans, and Cæsar demanded an interview with Ariovistus, who proudly replied, that "he did not see what Cæsar had to do with Gaul." After another message from Cæsar had been treated in the same scornful manner, the Roman forces under Cæsar advanced and occupied Vesontio (now Besançon), the chief city of the Sequani. A furious engagement took place B.C. 58, in which Roman discipline prevailed over the German forces, which were utterly routed. Ariovistus, with only a few followers, escaped over the Rhine into his own country. His subsequent history is unknown. Consult Cæsar, *De Bello Gallico*.

ARIPA, ă-rĕ'pȧ. A Malay people of Cagayan Province, Luzon. They speak a distinct dialect. See Philippines.

ARISTA, ȧ-rēs'tȧ, Mariano (1802-55). A Mexican general. He was in command of the Mexican Army of the North in 1846, and was badly defeated by General Taylor at Palo Alto (May 8) and Resaca de la Palma (May 9). He was minister of war in 1848, and was elected President of Mexico in 1851, but resigned in 1853 to avert an impending revolution, and was banished soon afterward. He died in Europe.

ARIS'TA and **AWN.** See Gramineæ.

AR'ISTÆN'ETUS (Gk. *'Αρισταίνετος*, *Aristainetos*) (?-c.484 A.D.). A Greek epistolary writer. He is thought to be the author of two books of love-stories in the forms of letters (*'Επιστολαὶ 'Ερωτικαί*, *epistolai erōtikai*), imitations of Alcephron, and taken almost entirely from Plato, Lucian, Philostratus, and Plutarch. They have been edited by Boissonade (1822), and the text and a Latin version are contained in the Didot collection of the *Epistolographi Græci* (1873). Aristænetus should not be confused with Aristænetus of Nicæa.

AR'ISTÆ'US (Gk. *'Αρισταῖος*, *Aristaios*). An ancient divinity whose worship in the earliest times seems to have been widely diffused throughout Greece, but who is known only in scattered and fragmentary traditions. According to the common tradition, he was the son of Apollo and Cyrene, the latter the granddaughter of Peneius, a river-god of Thessaly. She is said to have given birth to Aristæus on the coast of Libya, in Africa, whence the region is alleged to have derived its name of Cyrenaica. Hermes placed the child in the care of the Horæ and Gaia (earth). Another version placed his birth in Thessaly and made him a pupil of Chiron the centaur. He appears at Thebes in Bœotia as son-in-law of Cadmus and father of Actæon (q.v.). Still another story brings him from Arcadia to the island of Ceos, where he was honored as having freed the island from the heat of the dog-star by erecting an altar to Zeus Icmæus, the rain-maker, who rewarded this piety by sending the Etesian winds. Aristæus also appears in Corcyra, Eubœa, Sicily, and even Thrace, where he is one of a band of Dionysus. These stories are obviously not fragments of a connected narrative, but rather a number of local traditions connected with a divinity known as "the Good," whose very transparent name prevented his attaining the rank of a great god, though many of his activities are those attributed to Zeus and Apollo. He is connected with the life and interests of hunters and herdsmen, taught bee-keeping, the care of the olive tree, and the spinning of wood, and introduced to Cyrene its valuable plant, Silphium (asafœtida).

AR'ISTAG'ORAS (Gk. Ἀρισταγόρας) (?-497 B.C.). A tyrant of Miletus and brother-in-law of Histiæus. During the stay of Histiæus at the Persian court, Aristagoras was made governor of Miletus, and in B.C. 501 made an unsuccessful attack on Naxos, which he had promised to subdue for the Persians. Fearful of the consequences of his failure, he induced the Ionian cities to revolt from Persia, and after vainly applying to Sparta for aid, obtained troops and twenty ships from the Athenians. The allies captured and burned Sardis (B.C. 499), but were finally driven to the coast by the Persians, and Aristagoras, in despair, fled to Thrace, where he was slain by the Edonians.